

THE
TUTOR'S ASSISTANT:
BEING
A Compendium of ARITHMETIC;
AND
A Complete QUESTION-BOOK.

In FIVE PARTS.

CONTAINING,

- | | |
|---|--|
| <p>I. <i>Arithmetic</i> in whole Numbers; being a brief Explanation of all its Rules, in a new and more concise Method than any hitherto published; with an <i>Application</i> to each Rule, consisting of a large Variety of Questions in real Business, with their Answers annexed.</p> <p>II. <i>Vulgar Fractions</i>, which are treated with a great deal of Plainness and Perspicuity.</p> <p>III. <i>Decimals</i>, with the <i>Extraction</i> of the Square, Cube, and Biquadrate Roots, after a very plain and familiar Manner, in which are set down Rules for the easy calculat-</p> | <p>ing of Interest, Annuities, and Pensions in Arrears, the present Worth of Annuities, &c. either by simple or Compound Interest.</p> <p>IV. <i>Duodecimals</i> or Multiplication of Feet and Inches, with Examples applied to measuring, and worked by Multiplication, Practice, and Decimals: To which is added, a Method of multiplying several Figures by several, and the Product to be produced in one Line only.</p> <p>V. A Collection of Questions set down promiscuously, for the greater Trial of the foregoing Rules.</p> |
|---|--|

The whole being adapted either as a QUESTION BOOK for the Use of SCHOOLS, or as a REMEMBRANCER and INSTRUCTOR to such as have some Knowledge therein.

This Work having been perused by several Eminent MATHEMATICIANS and ACCOMPTANTS, is recommended as the best COMPENDIUM hitherto published for the Use of SCHOOLS, as well as for PRIVATE PERSONS.

The THIRD EDITION, with several ADDITIONS, particularly a New and very short Method of extracting the CUBE ROOT.

By FRANCIS WALKINGAME,
Writing-Master and Accomptant.

L O N D O N :

Printed for the AUTHOR, and sold by W. REEVE, at Shakespear's Head, opposite Crane-Court, Fleet-street, and J. SWAN, in the Strand, near Chairing-Cross, 1757.



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P R E F A C E.

THE Public, no doubt, will be surprized to find there is another Attempt made to publish a Book of ARITHMETIC, when there are such Numbers already extant on the same Subject, and several of them that have so lately made their Appearance in the World; but I flatter myself, that the following Reasons which induced me to compile it, the Method, and the Conciseness of the Rules, which are laid down in so plain and familiar a Manner, will have some Weight towards its having a favourable Reception.

Having some Time ago drawn up a Set of Rules, and proper Questions, with their Answers annexed, for the Use of my own School, and divided them into several Books, as well for the more Ease of myself, as the readier Improvement of my Scholars, I found them, by Experience, of Infinite Use; for when a Master takes upon him that laborious (tho' unnecessary) Me-

thod of writing out the Rules and Questions in the Children's Book, he must either be toiling and slaving himself, after the Fatigue of the School is over, to get ready the Books for the next Day, or else must lose that Time which would be much better spent in instructing and opening the Minds of his Pupils. There was however still an Inconvenience which hindered them from giving me the Satisfaction I at first expected, *i. e.* where there are several Boys in a Class, some one or other must wait till the Boy who first has the Book finishes the writing out those Rules or Questions he wants, which detains the others from making that Progress they otherwise might, had they a proper Book of Rules and Examples for each; to remedy which, I was prompted to compile one, in order to have it printed, as might not only be of Use to my own School, but to such others as would have their Scholars make a quick Progress. It will also be of great Use to such Gentlemen as have acquired some Knowledge of Numbers at School, to make them the more perfect; likewise to such as have completed themselves therein, it will prove, after an impartial Perusal, on Account of its great Variety and Brevity, a most agreeable and entertaining Exercise-Book. I shall not presume to say any Thing more in Favour of the Work, but beg Leave to refer the unprejudiced Reader to the Remark of a certain * Author, concerning Compositions of this Nature: His Words are as follow:

“ And

* *Dilworth.*

P R E F A C E.

“ And now after all, it is possible that some who like best to tread the old beaten Path, and so sweat at their Business, when they may do it with Pleasure, may start an Objection against the Use of this well-intended ASSISTANT, because the Course of ARITHMETIC is always the same, and therefore say, *That some Boys, lazily inclined, when they see another at work upon the same Question, will be apt to make his Operation pass for their own.* But these little Forgeries are soon detected by the Diligence of the TUTOR : Therefore as different Questions to different Boys do not in the least promote their Improvement ; so neither do the Questions hinder it. Neither is it in the Power of any Master (in the Course of his Business) how full of Spirits soever he be, to frame new Questions at Pleasure, in any Rule, but the same Question will frequently occur in the same Rule, notwithstanding his greatest Care and Skill to the contrary.

“ It may also be further objected, *that to teach by a printed Book is an Argument of Ignorance and Incapacity ;* which is no less trifling than the former. He indeed (if any such there be) who is afraid his Scholars will improve too fast, will undoubtedly decry this Method : But that Master's Ignorance can never be brought in Question, who can begin and end it readily, and most certainly that Scholar's Non-Improvement can be as little question'd, who

“ makes a much greater Progress by this, than
“ by the common Method”.

To enter into a long Detail of every Rule, would tire the Reader, and swell the Preface to an unusual Length ; therefore shall only give a general Idea of the Method of Proceeding, and leave the rest to speak for itself, which I hope the kind Reader will find to answer the Title, and the Recommendation given it. As to the Rules, they follow in the same Manner, as the Table of Contents specifies, and in much the same Order as they are generally taught in Schools. I have gone through the four fundamental Rules in Integers first, before those of several Denominations, in order that they being well understood, the latter will be performed with much more Ease and Dispatch, according to the Rules shewn, than by the customary Method of dotting. In Multiplication I have shewn both the Beauty and Use of that excellent Rule, in resolving most Questions that occur in Merchandizing, and have prefixed before Reduction, several Bills of Parcels, which are applicable to real Business. In working Interest by Decimals, I have added Tables to the Rules, for the readier calculating Annuities, &c. and have not only shewn the Use, but the Method of making them. I have also added to this *third Edition* a NEW RULE for extracting the *Cube Root*, being a much shorter Way than any that is already published ; and, I may venture to say, I have gone through the Whole with so much Plainness and Perspicuity, that there is none now extant that is better.

I have

I have nothing further to add, but to return my sincere Thanks to all those Gentlemen, Schoolmasters, and others for their kind Approbation, and Encouragement given to the former Editions; especially to those who have favoured me with their Remarks; and I must still beg of every candid and judicious Reader, that if he should by Chance find a Transposition of a Letter, or a false Figure, to excuse it; for notwithstanding there has been great Care taken in Correcting, yet Errors of the Press will inevitably creep in, and some may also have slipped my Observation: In either of which Cases, the Admonitions of a good-natured Reader will be very acceptable.



CONTENTS.

PART I.

ARITHMETIC in WHOLE NUMBERS.

	Page		Page
I ntroduction - - -	1	Purchasing of Stocks -	57
Numeration - - -	2	Brokage - - -	59
Integers, Addition - -	3	Compound Interest - -	64
Subtraction - - -	4	Rebate or Discunt - -	65
Multiplication - - -	5	Equation of Payments -	66
Division - - -	7	Barter - - -	68
Tables - - -	9	Profit and Loss - - -	69
Addition of several Denominations - - -	16	Fellowship - - -	71
Subtraction - - -	20	with Time - - -	73
Multiplication - - -	23	Alligation Medial - - -	74
Division - - -	26	Alternate - - -	76
Bills of Parcels - - -	28	Position, or Rule of False -	80
Reduction - - -	31	Double - - -	81
Single Rule of Three Direct -	42	Exchange - - -	83
Inverse - - -	45	Comparison of Weights and Measures -	87
Double Rule of Three - -	47	Conjoin'd Proportion - -	88
Practice - - -	48	Progression Arithmetical -	89
Simple Interest - - -	56	Geometrical - - -	92
Commission - - -	57	Permutation - - -	96

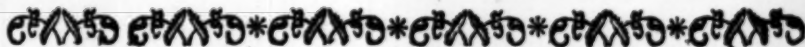
C O N T E N T S.



P A R T II.

V U L G A R F R A C T I O N S.

	Page		Page
<i>R</i> eduction - - -	97	<i>D</i> ivision - - -	106
<i>A</i> ddition - - -	104	<i>T</i> he Rule of Three Direct	107
<i>S</i> ubtraction - - -	ibid	Inverse	108
<i>M</i> ultiplication - - -	105	<i>T</i> he Double Rule of Three	ibid



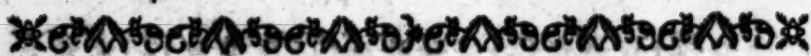
P A R T III.

D E C I M A L S.

	Page		Page
<i>N</i> umeration - - -	109	<i>A</i> general Rule for ex-tracting the Root of	131
<i>A</i> ddition - - -	110	<i>a</i> ll Powers - - -	133
<i>S</i> ubtraction - - -	111	<i>S</i> imple Interest - - -	134
<i>M</i> ultiplication - - -	ibid	for Days - - -	137
<i>C</i> ontracted Multiplication	112	<i>A</i> nnuities and Pensions, &c. in Arrears -	140
<i>D</i> ivision - - -	113	<i>P</i> resent Worth of Annuities	143
<i>C</i> ontracted - - -	114	<i>A</i> nnuities, &c. in Reversion	145
<i>R</i> eduction - - -	115	<i>R</i> ebate or Discount - - -	147
<i>D</i> ecimal Tables of Coin, } <i>W</i> eights and Measures }	118	<i>E</i> quation of Payments - - -	148
<i>T</i> he Rule of Three - - -	121	<i>C</i> ompound Interest - - -	151
<i>E</i> xtractions of the } <i>S</i> quare Root }	122	<i>A</i> nnuities, &c. in Arrears	154
<i>V</i> ulgar Fractions	123	<i>P</i> resent Worth of Annuities	156
<i>M</i> ixed Number	124	<i>A</i> nnuities, &c. in Reversion	158
<i>E</i> xtraction of the Cube Root	127	<i>P</i> urchasing Freehold or	159
<i>V</i> ulgar Fractions	129	<i>r</i> eal Estates - - -	160
<i>M</i> ixed Number	ibid	in Reversion - - -	160
<i>B</i> iquadrate Root	131	<i>R</i> ebate or Discount - - -	160

P A R T

C O N T E N T S.



PART IV.

D U O D E C I M A L S.

	Page		Page
<i>M</i> ultiplication of Feet and Inches	163	<i>M</i> easuring by the Rod	167
<i>M</i> easuring by the Foot	165	<i>M</i> ultiplying several Figures by several, and the Operation in one	168
Square - -	ibid	Line only - -	
Yard Square	ibid		
Square of 100 Feet - -	166		



PART V.

Q U E S T I O N S.

A Collection of Questions set down promiscuously for the greater Trial of the foregoing Rules 6 MAY 67 - Page 169

W R I.



W R I T I N G,

In all the various Hands now in Use;

A R I T H M E T I C,

Thro' all its different Rules;

VULGAR and DECIMAL FRACTIONS,

With the EXTRACTION of the

SQUARE and CUBE ROOT;

A L S O

D U O D E C I M A L S,

Are taught Abroad,

By F. W A L K I N G A M E,

At the *Water-Office* in *St. Martin's Lane*, near *Charing-Cross*.

Where may be had *The* TUTOR'S ASSISTANT.



Explanation of the Characters made, *use of in this COMPENDIUM.*

$=$ *Equal.* The Sign of Equality ; as, 4 *qrs.* $=$ 1 *cwt.* signifies, that 4 *qrs.* are equal to 1 *cwt.*

$-$ *Minus or less.* The Sign of Subtraction ; as, $8 - 2 = 6$, that is 8 lessened by 2 is equal to 6.

$+$ *Plus or more.* The Sign of Addition ; as, $4 + 4 = 8$, that is 4 add 4 more, is equal to 8.

$\times$ *Into or with.* The Sign of Multiplication ; as, $4 \times 6 = 24$, that is, 4 multiplied into 6, is equal to 24.

$\div$ *By.* The Sign of Division ; as, $8 \div 2 = 4$, that is, 8 divided by 2 is equal to 4.

$\frac{2375}{63}$ Numbers placed like a Fraction, do likewise denote Division, the upper Number being the Dividend, and the lower the Divisor.

$2 : 4 :: 8 : 16$ *So is.* The Sign of Proportion ; as, $2 : 4 :: 8 : 16$, that is, as 2 is to 4 so is 8 to 16.

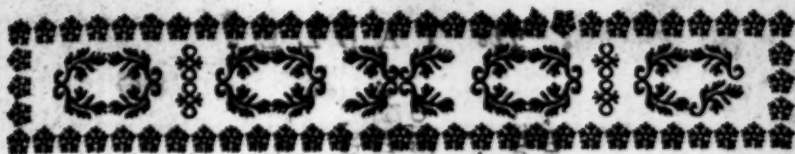
$7 - 2 + 5 = 10$. Shews that the Difference between 2 and 7 added to 5, is equal to 10.

$9 - 2 + 5 = 2$. Signifies, that the Sum of 2 and 5 taken from 9, is equal to 2.

$\sqrt{\quad}$ Prefix'd to any Number, signifies the Square Root of that Number is required.

$\sqrt[3]{\quad}$ Signifies the Cube, or third Power.

$\sqrt[4]{\quad}$ Denotes the Biquadrate, or the fourth Power, &c.



THE
TUTOR'S ASSISTANT,
BEING
A Compendium of Arithmetic.

PART I.

Arithmetic in whole Numbers.

The INTRODUCTION.

ARITHMETIC is the Art or Science of computing by Numbers, and consists both in Theory and Practice.

The Theory considers the Nature and Quality of Numbers, and demonstrates the Reason of practical Operations.

The Practice is that which shews the Method of working by Numbers, so as to be the most useful and expeditious for Business, and has five principal or fundamental Rules for the Operations; *Viz.*

NOTATION or NUMERATION, ADDITION, SUBTRACTION, MULTIPLICATION, and DIVISION.

NUMERATION

TEACHETH the different Value of Figures by their different Places, and to read and write any Sum or Number.

The TABLE.

C Millions. X Millions. Millions.			C Thousands. X Thousands. Thousands.			Hundreds. Tens. Units.		
9	8	7	6	5	4	3	2	1
9	0	0	0	0	0	0	0	0
8	0		0	0	0	0	0	0
7			0	0	0	0	0	0
			6	0	0	0	0	0
			5	0		0	0	0
			4			0	0	0
						3	0	0
						2	0	
								1

RULE. There are three Periods; the First on the Right-hand Units, the Second Thousands, and the Third Millions; each consisting of three Figures, or Places. Reckon the first Figure of each from the Left-hand as so many Hundreds; the next as Tens, and the Third as so many single ones of what is wrote over them: As the first Period on the Left-hand is read thus, Nine hundred eighty-seven Millions; and so on for any of the rest.

The APPLICATION.

Write down in proper Figures the following Numbers:

Twenty-three.

Two Hundred and Fifty-four.

Three Thousand, two Hundred and Four.

Twenty-five Thousand, eight Hundred Fifty-six.

One hundred thirty-two Thousand, two Hundred Forty-five.

Four Millions, nine hundred forty-one Thousand, four Hundred.

Twenty-seven Millions, one hundred fifty-seven Thousand, eight Hundred Thirty-two.

Seven hundred twenty-two Millions, two hundred thirty-one Thousand, five Hundred and Four.

Six hundred two Millions, two hundred ten Thousand, five Hundred.

Write

Write down in Words at Length the following Numbers.

35	2017	519007	5207054	65700047
59	5201	750058	2071906	900062057
275	20760	5900020	70054008	201900760

Notation by Roman Letters.

I One.	XXX Thirty.
II Two.	XL Forty.
III Three.	L Fifty.
IV Four.	LX Sixty.
V Five.	LXX Seventy.
VI Six.	LXXX Eighty.
VII Seven.	XC Ninety.
VIII Eight.	C Hundred.
IX Nine.	CC Two Hundred.
X Ten.	CCC Three Hundred.
XI Eleven.	CCCC Four Hundred.
XII Twelve.	D Five Hundred.
XIII Thirteen.	DC Six Hundred.
XIV Fourteen.	DCC Seven Hundred.
XV Fifteen.	DCCC Eight Hundred.
XVI Sixteen.	DCCCC Nine Hundred.
XVII Seventeen.	M One Thousand.
XVIII Eighteen.	MDCCLVI One Thousand
XIX Nineteen.	Seven Hundred and Fifty-six.
XX Twenty.	

INTEGERS.

ADDITION

TEACHETH to add two or more Sums together, to make one whole or total Sum.

RULE. There must be due Regard had in placing your Figures one under the other, *i. e.* Units under Units, Tens under Tens, &c. then beginning with the first Row of Units, add them up to the Top; when done, set down the Units, and carry the Tens to the next, and so on, continuing to the last Row, at which set down the total Amount.

PROOF. Begin at the Top of the Sum, and reckon the Figures downwards, the same as you added them up, and, if the same as the First, the Sum is supposed to be right.

ADDITION and SUBTRACTION TABLE.

1	2	3	4	5	6	7	8	9
2	4	5	6	7	8	9	10	11
3	5	6	7	8	9	10	11	12
4	6	7	8	9	10	11	12	13
5	7	8	9	10	11	12	13	14
6	8	9	10	11	12	13	14	15
7	9	10	11	12	13	14	15	16
8	10	11	12	13	14	15	16	17
9	11	12	13	14	15	16	17	18

£.	Cwt.	Qus.	Months.	£.	Years.
2	27	275	1234	7524	27104
5	35	110	7098	3750	32547
7	47	473	3214	9147	10738
9	35	354	6732	3214	62590
2	41	271	2546	4725	75408
5	36	352	3709	2147	27973
4	59	471	4152	3254	85421
3	37	310	3705	2716	12706
7	14	473	1076	1047	10471
44	331				

SUBTRACTION

TEACHETH to take a lesser Number from a greater, and shews the Remainder, or Difference.

RULE. This being the Reverse of Addition, you must borrow here (if it requires) what you stopped at there, always remembering to pay it to the next.

PROOF. Add the Remainder and lesser Line together, and, if the same as the greater, it is right.

	£.	Hund.	Hours.	Weeks.	Hogs.	Minutes.
From	271	3754	42087	452705	271508	3750914
Take	154	2725	35096	327616	152471	2150873
Rem.	117					
Proof.	271					

MULTI-

MULTIPLICATION

TEACHETH how to increase the greater of two Numbers given, as often as there are Units in the lesser; and compendiously performs the Office of many Additions.

To this Rule belongs three principal Members, *viz.*

1. The Multiplicand, or Number to be multiplied.
2. The Multiplier, or Number by which you multiply.
3. The Product, or Number produced by multiplying.

RULE. Begin with that Figure that stands in the Unit's Place of the Multiplier, and with it multiply the first Figure in the Unit's Place of the Multiplicand. Set down the Units, and carry the Tens in Mind, till you have multiplied the next Figure in the Multiplicand by the same Figure in the Multiplier; to the Product of which add the Tens you kept in Mind, setting down the Units, and proceed as before, till the whole Line is multiplied.

PROOF. The usual Way of proving Multiplication is, by casting out the Nines from the Multiplicand and Multiplier; the Remainders put on each Side of a Cross: Multiply the Figures on each Side together, cast the Nines from the Product, and put the Overplus at Top; then cast out the Nines from the Product of the Multiplication, and its Remainder place at the Bottom; and, if it agrees with the Top, the Work is supposed right. But the surest Way is, to divide the Product by the Multiplicand, and the Quotient will be the same as the Multiplier.

MULTIPLICATION and DIVISION TABLE.

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144

6 Multiplication of Integers.

The TUTOR'S

Multiplicand 25104736
Multiplier 2

52471021
3

7925437521
4

Product 50209472

27104107
5

321047
6

7092516
7

3725104
8

3215406
9

2701047
11

31040871
12

35210472
12

When the Multiplier is more than 12, and less than 20, multiply by the Unit Figure in the Multiplier, adding to the Product the back Figure to that you multiplied.

5710592
13

5107251
14

7653210
15

92057165
16

6251721
17

9215324
18

2571041
19

3592104
19

When the Multiplier consists of several Figures, there must be as many Products as there are Figures in the Multiplier, observing to put the first Figure of every Product under that Figure you multiplied by. Add the several Products together, and their Sum will be the total Product.

6/27

271041
27

32104
25

2710432
375

27501976
271

1897287
542082

802600

1016412000

7453035496

7318107

When Cyphers are placed between the significant Figures in the Multiplier, they may be omitted, but great Care must be taken that the next Figure must be put one Place more to the Left-hand, *i. e.* under the Figure you multiply by.

571204

ASSISTANT.

Multiplication of Integers.

571204
27009

15427648836

7104325
57020

405088611500

5271094
590030

3110103591820

When there are Cyphers at the End of the Multipli-
cand or Multiplier, they may be omitted, by only multi-
plying by the rest of the Figures, and setting down on
the Right-hand of the total Product, as many Cyphers
as were omitted.

27100
52600

1425460000

379500
274000

103983000000

265000
7200

1908000000

574000
630

361620000

When your Multiplier is a composite Number, *i. e.*
if any two Figures, being multiplied together, will make
that Number; then multiply by one of those Figures,
and that Product by the other, which will be the Answer.

571039 by 35

19986365

921563 by 32

29490016

715241 by 56

40053496

DIVISION

TEACHETH us to find how often one Number is
contained in another; or to divide any Number
into what Parts you please.

In this Rule there are three Numbers real, and a
fourth accidental, *viz.*

1. The Dividend, or Number to be divided.
2. The Divisor, or Number by which you divide.
3. The Quotient, or Number that shews how often the
Divisor is contained in the Dividend.

4th, or accidental Number, is what remains when the
Work is finished, and is of the same Name as the Divi-
dend.

RULE. When the Divisor is less than 12, find how
often it is contained in the first Figure in the Dividend;
set it down under the Figure you divided, and carry the
Overplus (if any) to the next in the Dividend, as so many
Tens; then find how often the Divisor is contained there-

8 Division of Integers.

The TUTOR'S

in, set it down, and continue the same till you have gone through the Line: But when the Divisor is more than 12, multiply it by the Quotient Figure; the Product subtract from the Dividend, and to the Remainder bring down the next Figure in the Dividend, and proceed as before, till the Figures are all brought down.

PROOF. Multiply the Divisor and Quotient together, adding the Remainder (if any) and the Product will be the same as the Dividend.

Dividend Rem.				
Divisor	2)725107(1	3)7210472(	4)7210416(	
Quotient	362553			
	2			
Proof	725107	5)7203287(	6)5231047(	
	7)2532701(	8)2547325(	9)25047306(	
	11)2750912(	12)2710513(	12)72104732(	

Divisor	Dividend	Quotient	
27	3210473	118906	
27		27	
51	832342		
27	237812		
		11	
240			
216	3210473	Proof	
244			
243			
	173		
	162		
Rem. 11			
	3721071	21071921473	(5662

When there are Cyphers at the End of the Divisor, they may be cut off, and as many Places off of the Dividend, but must be annexed to the Remainder at last.

ASSISTANT.

Tables of Money. 9

271|00)254732|21(939
375|000)752473|719(2006

5721|00)7253472|16(1267
215|000)6325104|997(29419

When the Divisor is a composite Number, *i. e.* if any two Figures, being multiplied together, will make that Number; then divide the Dividend by one of those Figures, and that Quotient by the other, it will give the Quotient required. — But as it sometimes happens, that there is a Remainder to each of the Quotients, and neither of them the true one, it may be found by this

RULE. Multiply the first Divisor into the last Remainder, to that Product add the first Remainder, which will give the true one.

Div. 3210473 by 27 7210473 by 35 6251043 by 42 5761034 by 54
118906.11 Rem. 206013.18 Rem. 148834.15 Rem. 106685.44 Rem.

TABLES of MONEY, WEIGHTS, and MEASURES.

M O N E Y.

Marked.

$\frac{1}{4}$ Farthing.	4 Farthings, make	1 Penny.	d.
$\frac{1}{2}$ Halfpenny.	12 Pence, - - -	1 Shilling.	s.
$\frac{3}{4}$ Three Farth.	20 Shillings, - - -	1 Pound.	l.

Marked.

Farthings.

4 = 1 Penny.
 48 = 12 = 1 Shilling.
 960 = 240 = 20 = 1 Pound.

T R O Y W E I G H T.

Marked.

24 Grains make - - 1 Pennyweight.
 20 Pennyweights, - - 1 Ounce.
 12 Ounces, - - - 1 Pound.

{ grs.
 dwt.
 oz.
 lb.

Grains.

24 = 1 Pennyweight.
 480 = 20 = 1 Ounce.
 5760 = 240 = 12 = 1 Pound.

By this Weight are weighed Gold, Silver, Jewels, Electuaries, Bread and all Liquors.

N. B.

10 Tables of Weight.

The Tutor's

N. B. The Standard for Gold Coin is 22 Carats of fine Gold, and two Carats of Copper melted together. For Silver, is 11 oz. 2 dwts. of fine Silver, and 18 dwts. of Copper.

25 lb. is a Quarter of an cwt. 100 lb. 1 cwt. 20 cwt. 1 Ton of Gold or Silver.

A VOIRDUPOISE WEIGHT.

			Marked.
16 Drains	- make -	1 Ounce.	$\left. \begin{array}{l} dr. \\ oz. \end{array} \right\}$
16 Ounces,	- - - -	1 Pound.	lb.
28 Pounds,	- - - -	1 Quarter.	qrs.
4 Quarters, or 112 lb.		1 Hundred Weight.	cwt.
20 Hundred Weight,	-	1 Ton.	Ton.

Drams.

16 = 1 Ounce.
 256 = 16 = 1 Pound.
 7168 = 448 = 28 = 1 Quarter.
 28672 = 1792 = 112 = 4 = 1 Hundred Weight.
 573440 = 35840 = 2240 = 80 = 20 = 1 Ton.

There are several other Denominations in this Weight, that are used in some particular Goods, viz.

	lb.		lb.
A Firkin of Butter,	56	A Gallon of Train Oil,	7½
Soap, -	64	A Truss of Straw,	36
A Barrel of Anchovies,	30	new Hay,	60
Soap, -	256	old Hay,	56
Raisins,	112	36 Truffles a Load.	

A Puncheon of Prunes 1120
 A Fother of Lead, 19 cwt.
 2 qrs.

A Stone of Iron Shot, } lb.
 or Horseman's wt. } 14
 Butchers Meat, 8

Cheese and Butter.
 A Clove, or Half Stone, 8
 A Wey in Suffolk, } 256
 - 32 Cloves, or }
 A Wey in Essex, 42, or 336

	lb.		lb.
	Wool.		
A Clove,	- - - - 7	A Wey is 6 Tod and } 182	
A Stone,	- - - - 14	1 Stone, or } 364	
A Tod,	- - - - 28	A Sack is 2 Weys, or 364	
		A Last is 12 Sacks, or 4368	

By

ASSISTANT.

Tables of Weight. 11

By this Weight is weighed any thing of a coarse or drossy Nature; as all Grocery and Chandelers Wares; and all Metals but Silver and Gold.

Note, 1 Pound Avoirdupoise is equal to 14 oz. 11 dwts. 15 gr. $\frac{1}{2}$ Troy.

A P O T H E C A R I E S W E I G H T.

			Marked.
20 Grains - make	1 Scruple.	{	grs.
3 Scruples - - -	1 Dram.		9
8 Drams - - -	1 Ounce.		3
12 Ounces, - - -	1 Pound		lb

Grains.

20 = 1 Scruple.
60 = 3 = 1 Dram.
480 = 24 = 8 = 1 Ounce.
5760 = 288 = 96 = 12 = 1 Pound.

Note, The Apothecaries mix their Medicines by this Rule, but buy and sell their Commodities by Avoirdupoise Weight.

The Apothecaries Pound and Ounce, and the Pound and Ounce Troy are the same, only differently divided and subdivided.

C L O T H M E A S U R E.

			Marked.
4 Nails - make -	1 Quarter of a Yard.	{	n.
3 Quarters, - - -	1 Ell Flemish.		grs.
4 Quarters, - - -	1 Yard.		E. F.
5 Quarters, - - -	1 Ell English.		yd.
6 Quarters, - - -	1 French Aune,		E. E.
			F. A.

Inches.

2 1/2 = 1 Nail.
9 = 4 = 1 Quarter.
36 = 16 = 4 = 1 Yard.
27 = 12 = 3 = 1 Ell Flemish.
45 = 20 = 5 = 1 Ell English.

L O N G

LONG MEASURE.

3 Barley-Corns	make	1 Inch.	} <i>Marked.</i> <i>bar.</i> <i>in.</i> <i>feet.</i> <i>yd.</i> <i>fath.</i> <i>rod. p.</i> <i>fur.</i> <i>mile.</i> <i>lea.</i> <i>deg.</i>
12 Inches,	- - - -	1 Foot.	
3 Feet,	- - - -	1 Yard.	
6 Feet,	- - - -	1 Fathom.	
5½ Yards,	- - - -	1 Rod, Pole, or Perch.	
40 Poles,	- - - -	1 Furlong.	
8 Furlongs,	- - - -	1 Mile.	
3 Miles,	- - - -	1 League.	
60 Miles,	- - - -	1 Degree.	

Barley-Corns.

3 =	1 Inch.
36 =	12 = 1 Foot.
108 =	36 = 3 = 1 Yard.
594 =	198 = 16½ = 5½ = 1 Pole.
23760 =	7920 = 660 = 220 = 40 = 1 Furlong.
190080 =	63360 = 5280 = 1760 = 320 = 8 = 1 Mile.

N. B. A Degree is 69 Miles, 4 Furlongs, very near, tho' commonly reckoned but 60 Miles.

This Rule is used to measure Distance of Places, or any Thing else, that has Length only.

WINE MEASURE.

2 Pints	- make -	1 Quart.	} <i>Marked.</i> <i>pts.</i> <i>qts.</i> <i>gal.</i> <i>run.</i> <i>½ bhd.</i> <i>tierce.</i> <i>bhd.</i> <i>P. or Butt.</i> <i>Tun.</i>
4 Quarts,	- - - -	1 Gallon.	
10 Gallons,	- - - -	1 Anchor of Brandy.	
18 Gallons,	- - - -	1 Runlet.	
31½ Gallons,	- - - -	Half an Hoghead.	
42 Gallons,	- - - -	1 Tierce.	
63 Gallons,	- - - -	1 Hoghead.	
2 Hogheads,	- - - -	1 Pipe, or Butt.	
2 Pipes, or 4 Hogheads,	- - - -	1 Tun.	

Inches.

Inches.

$28\frac{1}{2}$	=	1 Pint.	
$57\frac{1}{2}$	=	2 =	1 Quart.
231	=	8 =	4 = 1 Gallon.
9702	=	336 =	168 = 42 = 1 Tierce.
14553	=	504 =	252 = 63 = $1\frac{1}{2}$ = 1 Hoghead.
19404	=	672 =	336 = 84 = 2 = $1\frac{1}{3}$ = 1 Puncheon.
29106	=	1008 =	504 = 126 = 3 = 2 = $1\frac{1}{2}$ = 1 Pipe.
58212	=	2016 =	1008 = 252 = 6 = 4 = 3 = 2 = 1 Tun.

All Brandies, Spirits, Perry, Cyder, Mead, Vinegar, Honey, and Oil, are measured by this Measure; as also Milk: Not by Law, but Custom only.

ALE and BEER MEASURE.

2 Pints	-	make	-	1 Quart.	<i>pts.</i>
4 Quarts,	-	-	-	1 Gallon.	<i>qts.</i>
8 Gallons,	-	-	-	1 Firkin of Ale.	<i>gal.</i>
9 Gallons,	-	-	-	1 Firkin of Beer.	<i>A. fir.</i>
2 Firkins,	-	-	-	1 Kilderkin.	<i>B. fir.</i>
4 Firkins, or 2 Kilderkins,				1 Barrel.	<i>Kil.</i>
1 Barrel and $\frac{1}{2}$, or 54 Gallons,				1 Hoghead of Beer.	<i>Bar.</i>
3 Barrels, or 2 Hogheads,				1 Butt.	<i>bhd.</i>
					<i>Butt.</i>

BEER.

Cubick Inches.

$35\frac{1}{2}$	=	1 Pint.	
$70\frac{1}{2}$	=	2 =	1 Quart.
282	=	8 =	4 = 1 Gallon.
2538	=	72 =	36 = 9 = 1 Firkin.
5076	=	144 =	72 = 18 = 2 = 1 Kilderkin.
10152	=	288 =	144 = 36 = 4 = 2 = 1 Barrel.
15228	=	432 =	216 = 54 = 6 = 3 = $1\frac{1}{2}$ = 1 Hoghead.
30456	=	864 =	432 = 108 = 12 = 6 = 3 = 2 = 1 Butt.

ALE.

Cubick Inches.

$35\frac{1}{2}$	=	1 Pint.	
$70\frac{1}{2}$	=	2 =	1 Quart.
282	=	8 =	4 = 1 Gallon.
2256	=	64 =	32 = 8 = 1 Firkin.
4512	=	128 =	64 = 16 = 2 = 1 Kilderkin.
9024	=	256 =	128 = 32 = 4 = 2 = 1 Barrel.
13536	=	384 =	192 = 48 = 6 = 3 = $1\frac{1}{2}$ = 1 Hoghead.

14 Tables of Measure.

The TUTOR'S

In London they compute but 8 Gallons to the Firkin of Ale, and 32 to the Barrel; but in all other Parts of England, for Ale, Strong Beer, and Small, 34 Gallons to the Barrel, and 8 Gallons and $\frac{1}{2}$ to the Firkin.

N. B. A Barrel of Salmon, or Eels, is 42 Gallons.
 A Barrel of Herrings, - - - 32 Gallons.
 A Keg of Sturgeon, - - - 4 or 5 Gallons.
 A Firkin of Soap, - - - 8 Gallons.

DRY MEASURE.

2 Pints,	-	make	-	1 Quart.	{	pts.
2 Quarts,	-	-	-	1 Pottle.		qts.
2 Pottles,	-	-	-	1 Gallon.		pot.
2 Gallons,	-	-	-	1 Peck.		gal.
4 Pecks,	-	-	-	1 Bushel.		pk.
2 Bushels,	-	-	-	1 Strike.		bu.
4 Bushels,	-	-	-	1 Coom.		strike.
2 Cooms, or 8 Bushel,				1 Quarter.		coom.
4 Quarter,	-	-	-	1 Chaldron.		qr.
5 Quarters,	-	-	-	1 Wey.		chal.
2 Weys,	-	-	-	1 Last.		wey.
						last.

In London 36 Bushels make a Chaldron.

Solid Inches.

268 $\frac{1}{4}$ = 1 Gallon.
 537 $\frac{1}{2}$ = 2 = 1 Peck.
 2150 $\frac{1}{2}$ = 8 = 4 = 1 Bushel.
 4300 $\frac{1}{2}$ = 16 = 8 = 2 = 1 Strike.
 8601 $\frac{1}{2}$ = 32 = 16 = 4 = 2 = 1 Coomb.
 17203 $\frac{1}{2}$ = 64 = 32 = 8 = 4 = 2 = 1 Quart.
 86016 = 320 = 160 = 40 = 20 = 10 = 5 = 1 Wey.
 372032 = 640 = 320 = 80 = 40 = 20 = 10 = 2 = 1 Last.

The Bushel in Water-measure is 5 Pecks.

A Score of Coals, is 21 Chaldron.
 A Sack of Coals, 3 Bushels.
 A Load of Corn, 5 Bushels.
 A Cart Load ditto, 40 Bushels.

This Measure is applied to all dry Goods.

The Standard Bushel is 18 Inches and $\frac{1}{2}$ wide, and 8 Inches deep.

T I M E.

T I M E.

60 Seconds,	- make -	1 Minute.	Marked. }
60 Minutes,	- - - -	1 Hour.	hour.
24 Hours,	- - - -	1 Day.	day.
7 Days,	- - - -	1 Week.	week.
4 Weeks,	- - - -	1 Month.	mo.
13 Months,	1 Day, 6 Hours,	1 Julian Year.	
365 Days, 5 Hours, 48 Minutes, and 57 Seconds,		1 Solar Year.	

Seconds.

60=	1 Minute.	
3600=	60=	1 Hour.
86400=	1440=	24=1 Day.
604800=	10080=	168= 7=1 Week.
2419200=	40320=	672= 28=4=1 Month.
31557600=525960=8766=365.6=52.1.6=1 Julian Yr.		
31556937=525948=8765=365.5.48.57=1 Solar Yr.		

To know the Days in each Month, observe,

*Thirty Days hath September,
April, June, and November,
February hath twenty-eight alone,
All the rest have thirty and one;
Except in Leap-year, and then's the Time,
February's Days are twenty and nine.*

S Q U A R E M E A S U R E.

144 Inches,	- make -	1 Foot.
9 Feet,	- - - -	1 Yard.
100 Feet,	- - - -	1 Square of Flooring.
272½ Feet,	- - - -	1 Rod.
40 Rods,	- - - -	1 Rood.
4 Roods, or 160 Rods, or 4840 Yards,		1 Acre of Land.
640 Acres,	- - - -	1 Square Mile,
30 Acres,	- - - -	1 Yard of Land.
100 Acres,	- - - -	1 Hide of Land.

Inches:

144 = 1 Foot.
 1296 = 9 = 1 Yard.
 39204 = 272 $\frac{1}{2}$ = 30 $\frac{1}{4}$ = 1 Pole.
 1568160 = 10890 = 1210 = 40 = 1 Rood.
 6272640 = 43560 = 4840 = 160 = 4 = 1 Acre.

By this Measure are measured all Things that have Length and Breadth; such as Land, Painting, Plastering, Flooring, Thatching, Plumbing, and Glazing, &c.

SOLID MEASURE.

1728 Inches, - make - 1 Solid Foot.
 27 Feet, - - - 1 Yard, or Load of Earth.
 40 Feet of Round Timber, }
 Or, 50 Feet of Hewn Timber, } is 1 Tun, or Load.
 108 Solid Feet, *i. e.* 12 Feet in Length, 3 Feet in Breadth, and 3 deep; or, commonly, 14 Feet long, 3 Feet 1 Inch broad, and 3 Feet 1 Inch deep, is a Stack of Wood.
 128 Solid Feet, *i. e.* 8 Foot long, 4 Foot broad, and 4 Foot deep, is a Cord of Wood.

By this Measure are measured all Things that have Length, Breadth, and Depth.

ADDITION of MONEY, WEIGHTS, and MEASURES.

RULE. Add the first Row or Denomination together, as in Integers; then divide the Sum by as many of the same Denomination as make one of the next greater, setting down the Remainder under the Row added, and carry the Quotient to the next superior Denomination, continuing the same to the last, which add as in simple Addition.

PROOF. As in Integers.

	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>
Money.	2	13	4 $\frac{1}{2}$	27	7	1	35	17	3	75	3	7
	7	9	5 $\frac{1}{4}$	35	14	7 $\frac{1}{2}$	59	14	7 $\frac{1}{2}$	54	17	1 $\frac{1}{2}$
	5	15	4 $\frac{1}{2}$	57	19	2 $\frac{1}{4}$	97	13	5 $\frac{1}{4}$	91	15	4 $\frac{1}{4}$
	9	17	6 $\frac{1}{4}$	91	16	1	35	16	8 $\frac{1}{4}$	35	16	5 $\frac{1}{4}$
	7	16	3	75	18	7 $\frac{1}{4}$	97	15	7	27	19	7 $\frac{1}{4}$
	5	14	7 $\frac{1}{4}$	97	13	5	59	16	5 $\frac{1}{2}$	91	17	3 $\frac{1}{2}$
	9	16	5	45	16	7 $\frac{1}{2}$	97	15	7 $\frac{1}{4}$	75	2	4
	6	15	4 $\frac{1}{2}$	19	18	9 $\frac{1}{4}$	55	18	2 $\frac{1}{2}$	57	13	3 $\frac{1}{2}$
	<u>55</u>	<u>18</u>	<u>4 $\frac{1}{2}$</u>									

ASSISTANT.

Addition of Weight. 17

<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>
3257	1	4 $\frac{1}{2}$	525	2	4 $\frac{1}{2}$	321	14	7 $\frac{1}{2}$	75	3	1 $\frac{1}{2}$
2704	3	7 $\frac{1}{2}$	179	3	5	275	16	3	25	12	7
1595	5	3	350	14	7 $\frac{1}{2}$	379	2	4 $\frac{1}{2}$	95	13	5 $\frac{1}{2}$
7059	13	7 $\frac{1}{2}$	975	3	5 $\frac{1}{2}$	257	16	5 $\frac{1}{2}$	76	17	3 $\frac{1}{2}$
5207	5	4	254	15	7	196	13	8 $\frac{1}{2}$	97	14	1
3798	16	7 $\frac{1}{2}$	379	14	5 $\frac{1}{2}$	154	2	7	54	13	7 $\frac{1}{2}$
1524	3	11 $\frac{1}{2}$	254	3	1	397	1	4 $\frac{1}{2}$	27	19	5
2310	12	1	791	7	6	154	2	7 $\frac{1}{2}$	14	7	2 $\frac{1}{2}$

<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>
172	4	7 $\frac{1}{2}$	251	17	1 $\frac{1}{2}$	25	1	4 $\frac{1}{2}$	27	13	5
325	13	5	379	13	5	76	13	1	15	7	9 $\frac{1}{2}$
271	0	7 $\frac{1}{2}$	257	16	7 $\frac{1}{2}$	35	19	7 $\frac{1}{2}$	9	15	3
524	19	1	184	13	5	97	17	3	15	2	7 $\frac{1}{2}$
379	14	3 $\frac{1}{2}$	795	2	7 $\frac{1}{2}$	35	13	5 $\frac{1}{2}$	37	19	1
215	15	9 $\frac{1}{2}$	359	16	5 $\frac{1}{2}$	27	16	3	56	13	7 $\frac{1}{2}$
709	13	5 $\frac{1}{2}$	916	13	1	51	14	7 $\frac{1}{2}$	78	14	1
254	17	1 $\frac{1}{2}$	157	2	7 $\frac{1}{2}$	19	17	3	15	2	1 $\frac{1}{2}$

Troy Weight.	<i>oz.</i>	<i>dwt.</i>	<i>gr.</i>	<i>oz.</i>	<i>dwt.</i>	<i>gr.</i>	<i>lb.</i>	<i>oz.</i>	<i>dwt.</i>	<i>gr.</i>	<i>lb.</i>	<i>oz.</i>	<i>dwt.</i>	<i>gr.</i>
	7	15	21	5	11	4	7	1	2	21	5	2	15	4
	3	17	6	7	19	21	3	2	17	14	3	11	17	23
	2	5	14	3	15	14	5	1	15	21	9	7	15	4
	3	16	19	7	19	22	7	10	18	5	4	5	13	17
	9	18	23	9	18	15	2	7	14	16	3	9	7	10
	7	15	14	8	13	12	3	11	18	10	5	2	15	21
	5	18	16	7	15	18	9	7	15	2	9	3	17	15
	9	17	2	2	16	3	5	4	16	21	2	10	7	15

Avoir- du-poise	lb.	oz.	dr.	lb.	oz.	dr.	cwt.	qrs.	lb.	T. C.	qrs.	lb.	
Weight.	159	15	14	17	12	3	25	1	17	7	17	2	21
	272	14	10	23	15	6	79	3	27	5	4	3	27
	303	15	11	31	11	14	54	1	6	2	5	0	16
	255	10	4	97	0	9	25	3	16	3	18	2	5
	973	6	2	48	7	15	37	0	19	7	9	3	26
	605	13	14	79	10	6	55	2	16	8	15	1	17
	517	8	9	57	15	4	71	0	27	9	10	0	6
	239	15	6	23	10	12	19	2	14	5	14	3	25

18 Addition of Measure.

The Tutor's

Apothecaries	3 3 3 gr.	3 3 3 gr.	lb. 3 3 3	lb. 3 3 3 gr.
Weight.	7 7 1 17	9 2 1 17	7 10 7 2	7 2 1 0 17
	9 3 0 18	3 5 2 19	9 5 2 0	3 1 7 1 15
	5 6 2 16	9 2 1 14	7 11 1 2	9 10 2 0 6
	7 5 1 15	3 5 0 18	9 5 6 1	7 5 7 1 17
	3 7 0 18	7 7 2 15	7 10 5 2	3 9 5 2 0
	9 3 1 5	9 3 0 0	9 0 3 0	7 1 4 1 7
	4 7 2 16	7 2 1 5	2 7 5 2	9 3 6 0 18
	9 3 0 7	6 0 2 17	9 2 4 1	7 1 0 1 16

Cloth Measure.	E.F. qrs. n.	yds. qrs. n.	yds. qrs. n.	E.E. qrs. n.
	27 2 1	35 3 2	75 3 1	76 4 1
	15 1 3	76 2 3	97 1 3	52 1 2
	37 0 2	95 3 0	54 0 2	79 0 1
	52 1 3	76 1 3	76 2 0	56 2 0
	76 2 1	25 0 1	59 1 3	79 3 0
	97 1 3	79 2 1	76 3 1	54 2 1
	55 2 2	54 3 2	59 2 0	98 4 2
	73 0 1	76 0 2	97 0 2	75 3 1

Long Measure.	feet. in. bar.	yds. f. in.	m. fur. p.	lea. m. fur. p.
	27 9 2	25 1 9	35 7 3	72 2 1 37
	35 10 1	71 0 3	27 5 27	27 1 7 21
	17 2 2	52 1 2	52 0 35	35 2 5 14
	35 11 1	97 0 10	97 1 17	79 0 6 2
	97 2 0	54 2 7	56 7 18	51 1 6 13
	54 8 1	37 1 4	91 5 27	72 0 5 27
	76 3 2	25 2 7	25 2 14	35 1 3 31
	52 7 1	96 0 5	17 0 15	19 0 7 16

Land Measure.	a. r. p.	a. r. p.	a. r. p.	a. r. p.
	75 3 27	27 1 35	26 1 31	32 1 14
	36 2 15	29 2 16	19 2 17	27 0 16
	97 1 16	37 1 15	55 1 14	31 2 15
	35 2 15	95 2 27	79 3 21	19 1 18
	27 1 14	62 0 13	95 2 14	36 2 37
	56 3 31	72 3 18	76 3 15	19 1 8
	78 2 28	55 1 14	14 1 10	75 0 3
	76 1 14	70 3 15	9 1 18	15 2 10

Wind

OR's

D gr.

O 17

1 15

O 6

1 17

2 0

1 7

O 18

1 16

rs. n.

4 1

1 2

O 1

2 0

3 0

2 1

4 2

3 1

ur. p.

1 37

7 21

5 14

6 2

6 13

5 27

3 31

7 16

r. p.

1 14

O 16

2 15

1 18

2 37

1 8

O 3

2 10

Wine

ASSISTANT.

Addition of Measure. 19

Wine	run. gal. qts.	tier. gal. qts.	bhds. gal. qts.	T. bhds. gal.
Measure.	27 17 2	25 36 2	31 57 1	14 3 27
	35 15 3	75 41 3	97 18 2	19 2 56
	56 14 1	62 15 1	76 13 1	17 0 39
	97 10 3	97 13 0	55 46 2	75 2 16
	52 15 0	15 14 1	87 38 3	54 1 19
	79 2 1	19 17 2	54 17 1	97 3 54
	98 17 2	35 3 3	97 29 2	13 1 61
	14 8 0	76 12 1	17 55 1	17 0 2

Ale	A.B. fir. gal.	B.B. fir. gal.	bhd. gal. qt.	bhd. gal. qt.
and	25 2 7	37 2 8	76 51 2	76 2 1
Beer.	17 3 5	54 1 7	57 3 1	95 34 2
	96 2 6	97 3 8	97 27 3	57 16 3
	75 1 4	78 2 5	54 17 2	21 14 1
	96 3 7	47 0 7	97 16 1	32 37 3
	75 0 5	35 2 5	56 38 0	57 16 1
	53 1 4	76 3 7	71 15 2	79 27 0
	79 0 6	91 0 5	97 18 1	17 15 1

Dry	qu. bu. p.	qu. bu. p.	ch. bu. p.	ch. bu. p.
Measure.	75 7 2	36 2 1	75 27 2	73 2 1
	37 3 3	71 0 3	57 3 1	41 24 0
	51 2 0	57 6 0	95 25 3	92 16 1
	76 7 1	82 4 1	76 35 2	79 13 2
	57 0 3	95 3 3	97 25 1	54 17 3
	95 2 1	78 2 1	75 16 3	76 25 1
	75 5 3	54 1 3	84 18 1	95 16 2
	68 2 1	79 2 1	96 28 1	54 17 1

Time.	h. m. "	d. h. m.	w. d. h.	w. d. h.
	52 57 35	72 23 27	71 3 11	57 2 15
	97 16 27	51 14 35	51 2 9	95 3 21
	16 53 45	97 13 28	76 0 21	76 0 18
	96 18 31	58 21 45	95 3 21	53 2 21
	75 35 21	96 20 48	76 1 15	98 0 18
	64 13 13	17 14 25	84 2 18	75 1 14
	75 18 47	91 18 32	75 1 16	37 0 16
	93 35 18	54 17 36	95 0 18	51 1 15

The

The APPLICATION.

1. A Man born in the Year 1750, when will he be 47 Years of Age? *Answer* 1797.

2. *A, B, C, D,* went Partners in the Purchase of a Quantity of Goods; *A* laid out 7*l.* half a Guinea, and a Crown, *B* 49*s.* *C* 54*s.* 6*d.* and *D* 87*d.* What was laid out in all? *Answer* 13*l.* 6*s.* 3*d.*

3. A Man lent his Friend at different Times these several Sums, *viz.* 63*l.* 25*l.* 15*s.* 32*l.* 7*s.* 15*l.* 14*s.* 10*d.* and fourscore and nineteen Pounds, half a Guinea, and a Shilling. How much did he lend in all? *Answer* 236*l.* 8*s.* 4*d.*

4. What's the Estate worth *per Ann.* when the Taxes are 21 Guineas, the net Income 8 Score 19*l.* 14*s.* *Ans.* 201*l.* 15*s.*

5. There are three Numbers, the first 215, the second 519, and the third is as much as the other two. What is the Sum of them all? *Answer* 1468.

6. Bought a Parcel of Goods, for which I paid 54*l.* 17*s.* for Packing 13*s.* 8*d.* Carriage 1*l.* 5*s.* 4*d.* and spent about the Bargain 14*s.* 3*d.* What do these Goods stand me in? *Answer* 57*l.* 10*s.* 3*d.*

7. There are two Numbers, the least whereof is 10, their Difference 14, I desire to know what is the greatest Number, and the Sum of both? *Answer* 54 greatest 94 Sum.

8. A Gentleman left his eldest Daughter 1500*l.* more than the Youngest, and her Fortune was 11 thousand, 11 hundred, and 11*l.* What was the eldest Sister's Fortune, and what did the Father leave them? *Eldest Sister's Fort.* 13611*l.* *Father left them,* 25722*l.*

SUBTRACTION of MONEY, WEIGHTS, and MEASURES.

RULE. Subtract as in Integers; only when any of the lower Denominations are greater than the Upper, borrow as many of that as make one of the next Superior, adding it to the Upper, from which take the lesser; set down the Difference, and carry 1 to the next lower Denomination, for what you borrowed.

PROOF. As in Integers.

Money.

ASSISTANT.

Subtraction 21

Money.	Borrowed	<i>l.</i>	<i>s.</i>	<i>d.</i>	Lent	<i>l.</i>	<i>s.</i>	<i>d.</i>
	Paid	715	2	7 $\frac{1}{4}$	316	3	5 $\frac{1}{2}$	
		476	3	8 $\frac{1}{2}$	Recd.	218	5	1 $\frac{1}{4}$

Remain to pay 238 18 10 $\frac{3}{4}$

Proof. 715 2 7 $\frac{1}{4}$

<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>
217	2	10	3	15	1 $\frac{1}{2}$	25	2	5 $\frac{1}{4}$	37	3	4 $\frac{1}{2}$
179	3	7 $\frac{1}{4}$	1	14	7	17	6	8 $\frac{1}{2}$	16	5	2 $\frac{1}{2}$

<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>
329	17	1 $\frac{1}{2}$	259	15	3 $\frac{1}{4}$	71	2	4	527	3	5 $\frac{1}{2}$
157	14	7	176	17	9 $\frac{1}{2}$	19	13	7 $\frac{1}{4}$	139	15	7 $\frac{1}{4}$

Borrowed	<i>l.</i>	<i>s.</i>	<i>d.</i>	Lent	<i>l.</i>	<i>s.</i>	<i>d.</i>
	25107	15	7		25106	1	6

Paid	375	2	5 $\frac{1}{4}$	Received	271	14	7 $\frac{1}{2}$
at	259	5	7 $\frac{1}{2}$	at	359	15	3
different	395	13	4 $\frac{1}{4}$	several	475	13	9 $\frac{1}{2}$
Times	523	17	3	Payments	527	15	3 $\frac{1}{2}$
	974	15	7 $\frac{1}{4}$		279	16	5
	325	13	5		750		

Paid in all

Received in all

Remains to pay

Remains due

Troy Weight.	oz.	dt.	gr.	oz.	dt.	gr.	lb.	oz.	dt.	gr.	lb.	oz.	dt.	gr.
Bought	27	15	2	37	5	15	52	1	7	2	7	2	5	5
Sold	21	14	7	26	7	14	39	0	15	7	5	7	10	7

Unfold

Avoidupoise Weight.	lb.	oz.	dr.	lb.	oz.	dr.	cwt.	qrs.	lb.	T.	ct.	qrs.	lb.
	25	11	15	35	10	5	35	1	20	21	1	2	7
	17	9	15	29	12	7	25	1	21	9	1	3	5

Apothecaries

22 Subtraction.

The TUTOR'S

Apothecaries Weight.	3 3 3 gr.	3 3 3 gr.	lb. 3 3 3	lb. 3 3 3
	27 1 0 1	3 1 2 4	5 2 1 0	9 7 2 1 3
	15 2 0 7	1 0 0 7	2 5 2 1	5 7 3 1 7

Cloth Measure.	E.F. qrs. n.	yds. qrs. n.	yds. qrs. n.	EE. qrs. n.
	35 2 1	47 1 0	71 1 2	35 2 1
	17 2 2	35 2 2	35 2 1	17 3 2

Long Measure.	f. in. bar.	yds. f. in.	m. fur. p.	lea. m. f. p.
	25 1 0	37 2 1	52 1 27	271 1 7 0
	17 2 2	15 2 7	35 7 35	150 0 3 27

Land Measure.	a. r. p.	a. r. p.	a. r. p.	a. r. p.
	75 1 7	37 1 27	25 0 1	325 2 1
	39 0 27	33 2 15	17 1 0	279 3 5

Wine Measure.	run. gal. qts.	tier. gal. qts.	hbd. gal. qts.	tun. hbd. gal.
	72 1 1	25 27 1	75 57 1	79 2 14
	35 1 2	19 35 2	57 59 1	35 3 27

Ale and Beer.	A.B. fir. gal.	B.B. fir. gal.	hbd. gal. qts.	hbds. gal. qts.
	25 1 1	37 2 1	27 27 1	709 2 1
	21 1 5	25 1 7	19 50 2	157 3 2

Dry Measure.	qu. bu. p.	qu. bu. p.	ch. bu. p.	ch. bu. p.
	72 1 2	65 2 1	79 3 0	35 3 3
	35 2 3	57 2 3	54 7 1	27 5 1

Time.	h. ' "	d. h. ' "	m. w. d.	m. w. d.
	75 1 27	72 1 51	35 2 1	25 2 1
	52 7 31	36 3 27	17 3 5	14 1 7

The APPLICATION.

1. A Man born in the Year 1723, what was his Age in the Year 1756? *Answer* 33.

2. What

ASSISTANT.

Multiplication. 23

2. What is the Difference between the Age of a Man born in 1710, and another born in 1756? *Answer* 46.

3. A Merchant had 5 Debtors, *A*, *B*, *C*, *D*, and *E*; which, together, owed him 1156 *l*. *B*, *C*, *D*, and *E*, owed him 737 *l*. what was *A*'s Debt? *Ans.* 419 *l*.

4. When an Estate of 300 *l*. *per Ann.* is reduced, on paying of Taxes, to 12 Score, and 14 *l*. 6 *s*. what is the Tax? *Ans.* 45 *l*. 14 *s*.

5. What is the Difference between 9154, and the Amount of 754 added to 305? *Answer* 8095.

6. A Horse in his Furniture is worth 37 *l*. 5 *s*. out of it 14 Guineas: How much does the Price of the Furniture exceed that of the Horse? *Answer* 7 *l*. 17 *s*.

7. A Merchant, at his Out-setting in Trade, owed 750 *l*. he had in Cash, Commodities, the Stocks, and good Debts, 12510 *l*. 7 *s*. He cleared the first Year by Commerce, 452 *l*. 3 *s*. 5 *d*. what was his neat Balance at the 12 Months End? *Answer* 12212 *l*. 10 *s*. 5 *d*.

8. A Gentleman dying left 45247 *l*. between two Daughters; the Youngest was to have 15 Thousand, 15 Hundred, and twice 15 *l*. what was the elder Sister's Fortune? *Answer* 28717 *l*.

MULTIPLICATION of several DENOMINATIONS.

RULE. Multiply the first Denomination by the Quantity given, dividing the Product by as many of that as make one of the next, setting down the Remainder, and add the Quotient to the next Superior, after it is multiplied.

If the given Quantity is above 12, multiply by any two Numbers, which multiplied together, will make the same Number; but if no two Numbers multiplied together will make the exact Number, then multiply the top-Line by as many as is wanting, adding it to the last Product.

PROOF. By Division.

<i>l</i> .	<i>s</i> .	<i>d</i> .	<i>l</i> .	<i>s</i> .	<i>d</i> .	<i>l</i> .	<i>s</i> .	<i>d</i> .	<i>l</i> .	<i>s</i> .	<i>d</i> .
35	12	7 $\frac{1}{4}$	75	13	1 $\frac{1}{2}$	62	5	4 $\frac{1}{2}$	57	2	4 $\frac{1}{2}$
		2			3			4			5
71	5	2 $\frac{1}{2}$									

24 Multiplication.

The TUTOR'S

lb.	oz.	dwt.	gr.	tun.	cwt.	qrs.	lb.	ys.	n.	qrs.	m.	fur.	p.
28	5	17	14	25	7	2	21	76	1	2	36	7	25
			7				8			2			5

a.	r.	p.	A.B. fir. gal.	B.B. fir. gal.	cb. bu. pk.
75	2	31	32 1 7	26 2 7	54 2 1
		9	7	3	5

18 Yds of Cloth, at 9 s. 6 d. per yd. $9 \times 2 = 18$

9
4 5 6
2
8 11 0

26 lb of Tea, at 1 l. 2 s. 6 d. per lb. $8 \times 3 + 2 = 26$

8
9 0 0
3
27 0 0

Top Line $\times 2 = 25 0$

29 5 0

17 Ells of Holland, at 7 s. 8 d. $\frac{1}{2}$ per Ell.

Facit 6 l. 11 s. 0 d. $\frac{1}{2}$.

35 Firkins of Butter, at 15 s. 3 d. $\frac{1}{2}$ per Firkin.

Facit 26 l. 15 s. 2 d. $\frac{1}{2}$.

75 lb. of Nutmegs, at 7 s. 2 d. $\frac{1}{2}$ per lb.

Facit 27 l. 2 s. 2 d. $\frac{1}{2}$.

37 yds. of Tabby, at 9 s. 7 d. per yd.

Facit 17 l. 14 s. 7 d.

97 cwt. of Cheefe, at 1 l. 5 s. 3 d. per cwt.

Facit 122 l. 9 s. 3 d.

43 doz. of Candles, at 6 s. 4 d. per doz.

Facit 13 l. 12 s. 4 d.

127 lb. of Bohea Tea, at 12 s. 3 d. per lb.

Facit 77 l. 15 s. 9 d.

135 Gallons of Rum, at 7 s. 5 d. per Gallon.

Facit 50 l. 1 s. 3 d.

74 Ells of Diaper, at 1 s. 4 d. $\frac{1}{2}$ per Ell.

Facit 5 l. 1 s. 9 d.

6 Doz. Pair of Gloves, at 10 s. 10 d. per Pair.

Facit 6 l. 12 s.

When the given Quantity consists of $\frac{1}{2}$, $\frac{1}{4}$, &c. divide the Price by $\frac{1}{2}$, $\frac{1}{4}$, &c. and add it to the Product.

ASSISTANT.

25 $\frac{1}{2}$ Ells of Holland, at 3 s.

4 d. $\frac{1}{2}$ per Ell.

$$5 \quad 5 \times 5 = 25$$

$$\begin{array}{r} 16 \quad 10 \quad \frac{1}{2} \\ 5 \end{array}$$

5

$$4 \quad 4 \quad 4 \quad \frac{1}{2} = 25$$

$$1 \quad 8 \quad \frac{1}{4} = \frac{1}{2}$$

$$4 \quad 6 \quad 0 \quad \frac{1}{4} = 25 \quad \frac{1}{2}$$

75 $\frac{1}{2}$ Ells of Diaper, at 1 s.

3 d. per Ell.

Facit 4 l. 14 s. 4 d. $\frac{1}{2}$.

19 $\frac{1}{2}$ Ells of Damask, at 4 s.

3 d per Ell.

Facit 4 l. 2 s. 10 d. $\frac{1}{2}$.

35 $\frac{1}{2}$ Ells of Dowlas, at 1 s.

4 d. per Ell.

Facit 2 l. 7 s. 4 d.

7 $\frac{1}{4}$ cwt. of Malaga Raisins, at 1 l. 1 s. 6 d. per cwt.

Facit 7 l. 15 s. 10 d. $\frac{1}{2}$.

6 $\frac{1}{2}$ Barrels of Herrings, at 3 l. 15 s. 7 d.

Facit 24 l. 11 s. 3 d. $\frac{1}{2}$.

35 $\frac{1}{2}$ cwt. of Double-refined Sugar, at 4 l. 15 s. 6 d. per cwt.

Facit 169 l. 10 s. 3 d.

154 $\frac{1}{2}$ cwt. of Tobacco, at

Multiplication. 25

4 l. 17 s. 10 d. per cwt.

Facit 755 l. 15 s. 3 d.

117 $\frac{1}{4}$ Gallons of Arrack, at 12 s. 6 d. per Gallon.

Facit 73 l. 5 s. 7 d. $\frac{1}{2}$.

85 $\frac{1}{4}$ cwt. of Cheese, at 1 l.

7 s. 8 d. per cwt.

Facit 118 l. 12 s. 5 d.

29 $\frac{1}{4}$ lb. of Fine Hyson Tea, at 1 l. 3 s. 6 d. per lb.

Facit 34 l. 7 s. 4 d. $\frac{1}{2}$.

17 $\frac{3}{4}$ yds of superfine Scarlet Drab, at 1 l. 3 s. 6 d. per yd.

Facit 20 l. 17 s. 1 d. $\frac{1}{2}$.

37 $\frac{1}{2}$ yds of rich Brocaded Silk, at 12 s. 4 d. per yd.

Facit 23 l. 2 s. 6 d.

56 $\frac{1}{4}$ cwt. of Sugar, at 2 l. 18 s. 7 d. per cwt.

Facit 166 l. 4 s. 7 d. $\frac{1}{4}$.

96 $\frac{1}{2}$ cwt. of Currants, at 2 l. 15 s. 6 d. per cwt.

Facit 267 l. 15 s. 9 d.

45 $\frac{3}{4}$ lb. of Belladine Silk, at 18 s. 6 d. per lb.

Facit 42 l. 6 s. 4 d. $\frac{1}{2}$.

87 Bushels $\frac{1}{4}$ of Wheat, at 4 s. 3 d. per Bushel.

Facit 18 l. 12 s. 11 d. $\frac{1}{4}$.

120 $\frac{3}{4}$ cwt. of Hops, at 4 l. 7 s. 6 d. per cwt,

Answer 528 l. 5 s. 7 d. $\frac{1}{2}$.

The APPLICATION.

1. What Sum of Money must be divided amongst 18 Men, so that each may receive 14 l. 6 s. 8 d. $\frac{1}{2}$? Answer, 258 l. 0 s. 9 d.

2. A Privateer of 250 Men, took a Prize which amounted to 125 l. 15 s. 6 d. to each Man, what was the Value of the Prize? Answer, 31443 l. 15 s. 0 d.

3. What is the Difference between 6 Dozen Dozen, and half a Dozen Dozen; and what is their Sum and Product? Answer, 792 Diff. Sum 936. Product 62208.

D

4. What

4. What Difference is there between twice Eight and Fifty, and twice Fifty-eight, and what's their Product? *Answer*, 50 *Difference*, 7656 *Product*.

5. There are 2 Numbers, the greater of them is 37 Times 45, and their Difference 19 Times 4; their Sum and Product are required? *Answer*, 3254 *Sum*, 264568 *Product*.

6. The Sum of 2 Numbers is 360, the less of them 144, what is their Product, and the Square of their Difference? *Answer*, 31104 *Product*, 5184 *Square of their Difference*.

7. If an Army, consisting of 187 Squadrons of Horse, each 157 Men, and 207 Battalions, each 560 Men, how many effective Soldiers, supposing that in 7 Hospitals there are 473 Sick? *Answer*, 144806.

8. What Sum did that Gentleman receive in Dowry with his Wife, whose Fortune was her Wedding Suit; her Petticoat having 2 Rows of Furbelows, each Furbelow 87 Quils, and each Quil 21 Guineas? *Answer*, 3836 *l.* 14 *s.*

9. A Merchant had 19118 *l.* to begin Trade with. For 5 Years together he cleared 1086 *l.* a Year; the next 4 Years he made good 2715 *l.* 10 *s.* 6 *d.* a Year: But the last 3 Years he was in Trade, had the Misfortune to lose, one Year with another, 475 *l.* 4 *s.* 6 *d.* a Year: What was his real Fortune at 12 Years End? *Answer*, 33984 *l.* 8 *s.* 6 *d.*

DIVISION of several DENOMINATIONS.

RULE. Divide the first Denomination on the Left-hand, and; if any remains, multiply them by as many of the next less as make one of that, which add to the next, and divide as before.

PROOF. By Multiplication.

<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>
2)25	2	4(	3)37	3	7(	4)57	1	6(	5)52	7	3(
12 11 2											
<i>lb.</i>	<i>oz.</i>	<i>dwt.</i>	<i>gr.</i>	<i>lb.</i>	<i>oz.</i>	<i>dr.</i>	<i>T.</i>	<i>cwt.</i>	<i>qrs.</i>	<i>lb.</i>	
2)75	3	7	5(	8)35	14	13(	6)75	10	1	13(	
<i>yds.</i>	<i>qrs.</i>	<i>n.</i>		<i>m.</i>	<i>f.</i>	<i>p.</i>		<i>yds.</i>	<i>f.</i>	<i>in.</i>	
11)35	1	3(		9)76	3	27(	12)75	2	9		
<i>A.B.</i>	<i>fir.</i>	<i>gal.</i>		<i>B.B.</i>	<i>fir.</i>	<i>gal.</i>		<i>ch.</i>	<i>bu.</i>	<i>pk.</i>	
22)35	2	5(		9)55	3	7(	11)357	2	1(		

The

The APPLICATION.

1. If a Man spends 257 *l.* 2 *s.* 5 *d.* in 12 Months Time, what is that *per Month*? *Answer*, 21 *l.* 8 *s.* 6 *d.* $\frac{1}{4}$.
2. The Clothing of Thirty-five Charity Boys came to 57 *l.* 3 *s.* 7 *d.* what is the Expence of each? *Answer*, 1 *l.* 12 *s.* 8 *d.*
3. If I gave 37 *l.* 6 *s.* 4 *d.* $\frac{1}{4}$. for nine Pieces of Cloth, what did I give *per Piece*? *Answer*, 4 *l.* 2 *s.* 11 *d.*
4. If 20 Cwt. of Tobacco came to 27 *l.* 5 *s.* 4 *d.* $\frac{1}{2}$. at what Rate is that *per Cwt.*? *Answer*, 1 *l.* 7 *s.* 3 *d.*
5. What is the Value of one Hoghead of Beer, when 120 are sold for 154 *l.* 17 *s.* 10 *d.* *Answer*, 1 *l.* 5 *s.* 9 *d.* $\frac{1}{4}$.
6. Bought 72 Yards of Cloth for 85 *l.* 6 *s.* I desire to know at what Rate *per Yard*? *Answer*, 1 *l.* 3 *s.* 8 *d.* $\frac{1}{4}$.
7. Gave 275 *l.* 3 *s.* 4 *d.* for 36 Bales of Cloth, what is that for 2 Bales? *Answer*, 15 *l.* 5 *s.* 8 *d.* $\frac{1}{4}$.
8. A Prize of 7257 *l.* 3 *s.* 6 *d.* is to be equally divided amongst 500 Sailors, what is each Man's Share? *Answer*, 14 *l.* 10 *s.* 3 *d.* $\frac{1}{4}$.
9. There are 2545 Bullocks to be divided among 509 Men, I desire to know how many each Man had, and the Value of each Man's Share, supposing every Bullock worth 9 *l.* 14 *s.* 6 *d.*? *Answer*, 5 Bullocks each Man. 48 *l.* 12 *s.* 6 *d.* each Share.
10. A Gentleman has a Garden wall'd in, containing 9625 Yards, the Breadth was 35 Yards, what was the Length? *Answer*, 275.
11. A Club in London, consisting of 25 Gentlemen, join'd for a Lottery Ticket of 10 *l.* Value, which came up a Prize of 4000 *l.* I desire to know what each Man contributed, and what each Man's Share came to? *Answer*, each contributed 8 *s.* each Share 160 *l.*
12. A Trader clear'd 1156 *l.* equally in 17 Years, how much did he lay by in a Year? *Answer*, 68 *l.*
13. Another clear'd 2805 in 7 $\frac{1}{2}$ Years, what was his yearly Increase of Fortune? *Answer*, 374 *l.*
14. What Number to the 43d Part of 4429 will raise it to 240? *Answer*, 137.
15. Divide 20 *s.* between A. B. and C. in such Sort, that A. may have 2 *s.* less than B. and C. 2 *s.* more than B. *Answer*, A. 4 *s.* 8 *d.* B. 6 *s.* 8 *d.* C. 8 *s.* 8 *d.*

28 Bills of Parcels.

The TUTOR

16. If there are 1000 Men to a Regiment, and but 50 Officers, how many private Men are there to one Officer? *Answer*, 19.

17. What Number is that which multiplied by 7847, will make the Product 3013248? *Answer*, 384.

18. The Quotient is 1083, the Divisor 28604, what was the Dividend, if the Remainder came out 1788? *Answer*, 30979920.

BILLS of PARCELS.

HOSIERY'S.

Mr. John Thomas

Bought of Samuel Green, March 7, 1756.

	S.	D.	
8 Pair of Worsted Stockings at	4	6	per Pair £.
5 Pair of Thread ditto - at	3	2	- - -
3 Pair black Silk ditto - at	14	0	- - -
6 Pair of milled Hose - at	4	2	- - -
4 Pair Cotton ditto - - at	7	6	- - -
2 Yards of fine Flannel at	1	8	per Yard

£. 7 12 2

MERCER'S.

Mr. Isaac Grant

Bought of John Sims, March 12, 1756.

	S.	D.	
15 Yards of Sattin - - at	9	6	per Yard £.
18 Yards of flower'd Silk at	17	4	- - -
12 Yards of rich Brocade at	19	8	- - -
16 Yards of Sarfenet - at	3	2	- - -
13 Yards of Genoa Velvet at	27	6	- - -
23 Yards of Lustring - at	6	3	- - -

£. 62 2 5

LINEN.

LINEN-DRAPER'S.

Mr. Simon Surety

Bought of Josiah Short, 27 March, 1756.
S. D.

4 Yards of Cambric	-	at	12	6 per Yard	£.
12 Yards of Muslin	-	at	8	3	-
15 Yards of printed Linen	at	5	4	-	-
2 Dozen of Napkins	-	at	2	3 each	-
14 Ells of Diaper	-	at	1	7 per Ell	-
35 Ells of Dowlas	-	at	1	1 $\frac{1}{2}$	-

£. 17 4 6 $\frac{1}{2}$

MILLENER'S.

Mrs. Bright

Bought of Lucy Brown, 5 April, 1756.
£. S. D.

18 Yards of fine Lace	-	at	12	3 per Yard	£.
5 Pair of fine Kid Gloves	at	2	2 per Pair	-	-
12 Fans of French Mount	at	3	6 each	-	-
2 Fine lac'd Tippets	at	3	3	0	-
4 Dozen of Irish Lamb	-	at	1	3 per Pair	-
6 Sets of Knots	-	at	2	6 per Set	-

£. 23 14 4

WOOLLEN-DRAPER'S.

Mr. Thomas Sage

Bought of Ellis Smith, 7 April, 1756.
S. D.

17 Yards of fine Serge	-	at	3	9 per Yard	£.
18 Yards of Drugget	-	at	9	0	-
15 Yards of superfine Scarlet	at	22	0	-	-
16 Yards of black ditto	-	at	18	0	-
25 Yards of Shalloon	at	1	9	0	-
17 Yards of Drab	-	at	17	6	-

£. 59 5 0

LEATHER-SELLER'S.

Mr. Giles Harris

Bought of Abel Smith, 15 April, 1756.

S. D.

27 Calf Skins	-	-	-	at	3	9	per Skin	£.
75 Sheep Skins	-	-	-	at	1	7	-	-
36 Coloured ditto	-	-	-	at	1	8	-	-
15 Buck Skins	-	-	-	at	11	6	-	-
17 Russia Hides	-	-	-	at	10	7	each	-
120 Lamb Skins	-	-	-	at	1	2	$\frac{1}{2}$	-

 £. 38 17 5

GROCER'S.

Mr. Richard Groves

Bought of Francis Ellor, 21 April, 1756.

S. D.

25 lb. of Lump Sugar	-	-	-	at	0	6	$\frac{1}{2}$	per lb.	£.
2 Loaves of double refined	}	at	0	11	$\frac{1}{2}$	-	-	-	-
Weight 15 lb.									
14 lb. of Rice	-	-	-	at	0	3	-	-	-
28 lb. of Malaga Raisins	-	-	-	at	0	5	-	-	-
15 lb. of Currants	-	-	-	at	0	5	$\frac{1}{2}$	-	-
7 lb. of black Pepper	-	-	-	at	1	10	-	-	-

 £. 3 2 9 $\frac{1}{2}$

CHEESEMONGER'S.

Mr. Charles Cross

Bought of Samuel Grant, 23 April, 1756.

S. D.

8 lb. of Cambridge Butter	-	-	-	at	0	6	per lb.	£.
17 lb. of new Cheese	-	-	-	at	0	4	-	-
$\frac{1}{2}$ Firkin of Butter, Wt. 28 lb.	at	0	5	$\frac{1}{2}$	-	-	-	-
5 Cheshire Cheeses, Wt. 127 lb.	at	0	4	-	-	-	-	-
2 Warwickshire ditto, Wt. 15 lb.	at	0	3	-	-	-	-	-
12 lb. of Cream Cheese,	-	-	-	at	0	6	-	-

 £. 3 14 7

CORN.

CORN-CHANDLER'S.

Mr. Abraham Doyley

Bought of Isaac Jones, 25 April, 1756;

1756.

				S.	D.
Tares	19 Bushels	- at	1	10	per Bushel. £.
Peas	18 Bushels	- at	3	9 $\frac{1}{2}$	- - -
Malt	7 Quarters	- at	25	0	per Quarter
Hops	15 lb.	- - at	1	5	per lb. - - -
Oats	6 Quarters	- at	2	4	per Bushel
Beans	12 Bushel	- at	4	8	- - - -

£. 23 7 4

7 5

R E D U C T I O N.

1756.

IS the bringing or reducing Numbers of one Denomination into other Numbers of another Denomination, retaining the same Value, and is perform'd by Multiplication and Division.

First, All great Names are brought into small, by multiplying with so many of the less as make one of the greater.

Secondly, All small Names are brought into great, by dividing with so many of the less as make one of the greater.

TABLE of Coins as are current in England.

1756.

		l. s. d.		l. s. d.	
These are Portugal Pieces.	Double Johns of	3	12 0	Guinea - - -	1 1 0
	Johns - - - -	1	16 0	Half ditto - - -	0 10 6
	Half ditto - - -	0	18 0	$\frac{1}{4}$ ditto - - -	0 5 3
	$\frac{1}{2}$ ditto - - - -	0	9 0	Crown - - -	0 5 0
	$\frac{1}{4}$ ditto - - - -	0	4 6	Half ditto - - -	0 2 6
	Moidore - - - -	1	7 0		
	Half ditto - - -	0	13 6		
	Quarter ditto - -	0	6 9		

Note, There are several Pieces that speak their own Value, such as a Sixpence, Four-pence, Threepence, Twopence, Penny, Halfpenny, Farthing.

7

R N.

R E

REDUCTION Descending.

1. In 8
- l.*
- how many Shillings and Pence?

20

160 Shillings.

12

1920 Pence.

2. In 12
- l.*
- how many Shillings, Pence and Farthings?

Answer, 240*s.* 2880*d.* 11520*far.*

3. How many Shillings, Pence and Farthings, are there in 18
- l.*
- ?
- Answer*
- , 360
- s.*
- 4320
- d.*
- 17280
- far.*

4. Reduce 7
- l.*
- and a Crown into Shillings and Pence.
- Facit*
- , 145
- s.*
- 1740
- d.*

5. How many Farthings are there in 21 Guineas?
- Answer*
- , 21168.

6. In 17
- l.*
- 5
- s.*
- 3
- d.*
- $\frac{1}{4}$
- . how many Farthings?
- Answer*
- , 16573.

7. In 25
- l.*
- 14
- s.*
- 1
- d.*
- how many Shillings and Pence?
- Answer*
- , 514
- s.*
- 6169
- d.*

8. In 15 Crowns, how many Shillings and Sixpences?
- Answer*
- 75
- s.*
- 150 Sixpences.

9. How many Crowns and Shillings in 25
- l.*
- Answer*
- 100
- cr.*
- 500
- s.*

10. In 57 Half Crowns, how many Pence and Farthings?
- Answer*
- , 1710
- d.*
- 6840
- far.*

11. In 52 Crowns, as many Half Crowns, Shillings and Pence, how many Farthings?
- Answer*
- , 21424.

12. How many Half Crowns, Sixpences and Threepences, in 75
- l.*
- ?
- Answer*
- , 600 half
- cr.*
- 3000 sixpences, 6000 threepences.

REDUCTION Ascending.

1. In 1920 Pence, how many Shillings and Pounds?
- Answer*
- , 160
- s.*
- 8
- l.*

12)1920

2|0)16|0(Shillings.

8 Pounds.

2. In

1. In 11520 Farthings, how many Pence, Shillings and Pounds? *Answer*, 2880 d. 240 s. 12 l.

3. How many Pence, Shillings and Pounds, are there in 17280 Farthings? *Answer*, 4320 d. 360 s. 18 l.

4. Reduce 1740 Pence into Shillings and Pounds. *Facit*, 145 s. 7 l. 5 s.

5. How many Guineas in 21168 Farthings? *Answer*, 21 Guineas.

6. In 16573 Farthings, how many Pounds? *Answer*, 17 l. 5 s. 3 d. $\frac{1}{4}$.

7. In 6169 Pence, how many Shillings and Pounds? *Answer*, 514 s. 25 l. 14 s. 1 d.

8. In 900 Pence, how many Shillings and Crowns? *Answer*, 75 s. 15 cr.

9. How many Crowns and Pounds in 500 Shillings? *Answer*, 100 cr. 25 l.

10. In 6840 Farthings, how many Pence and Half Crowns? *Answer*, 1710 d. 57 half cr.

11. In 21424 Farthings, how many Crowns, Half Crowns, Shillings and Pence, and of each an equal Number? *Answer* 52.

12. How many Sixpences, Half-Crowns and Pounds in 6000 Threepences? *Answer*, 3000 sixp. 600 half cr. 75 l.

Ascending and Descending.

1. In 1560 Pence how many Crowns and Shillings? *Answer*, 26 cr. 130 s. 6 l. 0 s. 6 d.

26 Crowns

5

130 Shillings.

2. Reduce 130 Shillings into Crowns and Pence. *Facit*, 26 cr. 1560 d.

3. How many Shillings, Crowns and Pounds in 60 Guineas? *Answer*, 1260 s. 252 cr. 63 l.

4. In 63 l. how many Crowns, Shillings and Guineas? *Answer*, 252 cr. 1260 s. 60 gui.

5. Reduce 76 Moidores into Shillings and Pounds. *Facit*, 2052 s. 102 l. 12 s.

6. Reduce 102 l. 12 s. into Shillings and Moidores. *Facit*, 2052 s. 76 moid.

7. How

34 Reduction.

The TUTOR'S

7. How many Shillings, Half Crowns and Crowns are there in 556*l.* and of each an equal Number? *Answer, 1308 of each, and 2*s.* over.*

8. In 1308 Half Crowns, as many Crowns and Shillings, how many Pounds? *Answer, 555*l.* 18*s.**

9. Seven Men brought 15*l.* 10*s.* each into the Mint to be chang'd for Guineas, how many must they have in all? *Answer, 103 guin. 7*s.* over.*

10. If 103 Guineas and 7 Shillings is to be divided among 7 Men, how many Pounds Sterling is that to each? *Answer, 15*l.* 10*s.**

11. A certain Person had 25 Purfes, and in each Purse 12 Guineas, a Crown and a Moidore, how many Pounds Sterling had he in all? *Answer, 355*l.**

12. A Gentleman in his Will leaves 50*l.* to the Poor, and order'd that $\frac{1}{3}$ should be given to ancient Men, each to have 5*s.* — $\frac{1}{4}$ to poor Women, each to have 2*s.* 6*d.* — $\frac{1}{5}$ to poor Boys, each to have 1*s.* — $\frac{1}{6}$ to poor Girls, each to have 9*d.* and the Remainder to the Person that distributed it. I demand how many of each Sort there were, and what the Person that distributed the Money had for his Pains? *Answer, 66 Men, 100 Women, 200 Boys, 222 Girls, 2*l.* 13*s.* 6*d.* to the Person.*

TROY WEIGHT.

1. In 27 Ounces of Gold, how many Grains? *Answer, 12960.*

2. In 12960 Grains of Gold, how many Ounces? *Answer, 27.*

3. In 3*lb.* 10*oz.* 7*dwt.* 5*gr.* how many Grains? *Answer, 22253.*

4. In 8 Ingots of Silver, each weighing 7*lb.* 4*oz.* 17*dwt.* 15*gr.* how many Ounces, Pennyweights and Grains? *Answer, 711*oz.* 14221*dwt.* 341304*gr.**

5. How many Ingots of 7*lb.* 4*oz.* 17*dwt.* 15*gr.* each, are there in 341304 Grains? *Answer, 8 Ingots.*

6. Bought 7 Ingots of Silver, each containing 23*lb.* 5*oz.* 7*dwt.* how many Grains? *Answer, 945336.*

7. A Gentleman sent a Tankard to his Goldsmith, that weighed 50*oz.* 8*dwt.* and ordered him to make it into Spoons, each to weigh 2*oz.* 16*dwt.* how many had he? *Answer, 18.*

8. A

8. A Gentleman delivered to a Goldsmith 137 oz. 6 dwt. 9 gr. of Silver, and ordered him to make it into Tankards of 17 oz. 15 dwt. 10 gr. each. Spoons of 21 oz. 11 dwt. 13 gr. per Dozen. Salts of 3 oz. 10 dwt. each; and Forks of 21 oz. 11 dwt. 13 gr. per Dozen; and for every Tankard to have one Salt, a Dozen of Spoons, and a Dozen of Forks; what is the Number of each he must have? *Answer, 2 of each Sort, 15 Grains over.*

AVOIRDUPOIS WEIGHT.

Note, There are several Sorts of Silk which are weighed by a great Pound of 24 oz. others by the common Pound of 16 oz. therefore

To bring great Pounds into common, multiply by 3, and divide by 2, or add one Half.

To bring small Pounds into great, multiply by 2, and divide by 3, or subtract one Third.

Things bought and sold by the Tale.

Dozens.

12 Pieces or Things make 1 Doz.
12 Dozen 1 Gross.
12 Gross, or 144 Doz. 1 Great }
Gross.

Paper and Parchment.

24 Sheets make 1 Quire.
20 Quire 1 Ream.
2 Reams 1 Bundle.
1 Doz. of Par. 12 Skins.
12 Skins 1 Roll.

1. In 14769 Ounces, how many cwt.? *Answer, 8 cwt. 0 qrs. 27 lb. 1 oz.*

2. Reduce 8 cwt. 0 qrs. 27 lb. 1 oz. into Quarters, Pounds and Ounces. *Facit, 32 qrs. 923 lb. 14769 oz.*

3. Bought 32 Bags of Hops, each 2 cwt. 1 qr. 14 lb. and another of 150 lb. how many cwt. in the whole? *Answer, 77 cwt. 1 qr. 10 lb.*

4. In 34 ton, 17 cwt. 1 qr. 19 lb. how many Pounds? *Answer, 78111 lb.*

5. In 350 great Pounds, how many common? *Answer, 525.*

6. In 27 cwt. of Raisins, how many Parcels of 18 lb. each? *Answer, 168.*

7. In 9 cwt. 2 qrs. 14 lb. of Indigo, how many Pounds? *Answer, 1078 lb.*

8. In

8. In 547 great Pounds how many common Pounds?
Answer, 820 com. lb. 8 oz.

9. Bought 27 Bags of Hops, each 2 cwt. 1 qr. 15 lb. and 1 Bag of 137 lb. how many Hundred in the Whole?
Answer, 65 cwt. 2 qrs. 10 lb.

10. How many Pounds in 27 Hogheads of Tobacco, each weighing neat 8 cwt. $\frac{3}{4}$? *Answer, 26460.*

11. In 552 common Pounds of Silk, how many great Pounds? *Answer, 368.*

12. How many Parcels of Sugar of 16 lb. 2 oz. are there in 16 cwt. 1 qr. 15 lb? *Answer, 113 par. 12 lb. 14 oz.*

The Allowances usually made in this Weight are, TARE, TRETT and CLOFF.

TARE is an Allowance made to the Buyer for the Weight of the Box, Barrel, Bag, &c. which contains the Goods bought, and is either

At so much *per* Box, Bag, Barrel, &c.

At so much *per* Cent. or

At so much in the *Gross Weight*.

TRETT is an Allowance of 4 lb. in every 104 lb. for Waste, Dust, &c. made by the Merchant to the Buyer.

CLOFF is an Allowance of 2 lb. to the Citizens of London on every Draught above 3 cwt. on some Sort of Goods.

GROSS WEIGHT is the whole Weight of any Sort of Goods, and that which contains it.

SUTTLE is when Part of the Allowance is deducted from the Gross.

NEAT is the pure Weight when all Allowances are deducted.

RULE 1st. When the Tare is at so much *per* Bag, Barrel, &c. multiply the Number of Bags, Barrels, &c. by the Tare, and subtract the Product from the Gross, the Remainder is neat.

Note, To reduce Pounds into Gallons, multiply by 2, divide by 15.

1. In 7 Frails of Raisins, each weighing 5 cwt. 2 qrs. 5 lb. Gross, Tare, at 23 lb. *per* Frail, how much neat Weight?
Answer, 37 cwt. 1 qr. 14 lb.

$$\begin{array}{r} 23 \\ 7 \ 4 \\ \hline \end{array}$$

$$\begin{array}{r} 28)161(5 \\ 140 \ 1 \ 1 \\ \hline \end{array}$$

21

$$\begin{array}{r} 5 \ 2 \ 5 \\ \hline 7 \end{array}$$

$$38 \ 3 \ 7 = \text{Gross wt.}$$

$$1 \ 1 \ 21 = \text{Tare}$$

$$37 \ 1 \ 14 \text{ Neat.}$$

2. In 241 Barrels of Figs, each 3 qrs. 19 lb. Gross, Tare 10 lb. per Barrel, how many Pounds neat? *Answer,* 22413.

3. What is the neat Weight of 25 Hogheads of Tobacco, weighing Gross 163 cwt. 2 qrs. 15 lb. Tare 100 lb. per Hoghead? *Answer,* 141 cwt. 1 qr. 7 lb.

4. In 16 Bags of Pepper, each 85 lb. 4 oz. Gross, Tare per Bag 3 lb. 5 oz. how many Pounds neat? *Answer,* 1311.

RULE 2. When the Tare is at so much in the whole Gross Weight, subtract the given Tare from the Gross, the Remainder is neat.

1. What is the neat Weight of 5 Hogheads of Tobacco, weighing Gross 75 cwt. 1 qr. 14 lb. Tare in the Whole 752 lb.? *Answer,* 68 cwt. 2 qrs. 18 lb.

2. In 75 Barrels of Figs each 2 qrs. 27 lb. Gross, Tare in the Whole 597 lb. how much neat Weight? *Answer,* 50 cwt. 1 qr.

RULE 3. When the Tare is so much per Cent. divide the Gross Weight by the aliquot Parts of an cwt. which subtract from the Gross, the Remainder is neat.

Note, 7 lb. is $\frac{1}{8}$. 8 lb. is $\frac{1}{10}$. 14 lb. is $\frac{1}{5}$. 16 lb. is $\frac{1}{7}$.

1. What is the neat Weight of 18 Butts of Currants, each 8 cwt. 2 qrs. 5 lb. Tare at 14 lb. per Cent?

$$8 \ 2 \ 5$$

$$9 \times 3 = 18.$$

$$\begin{array}{r} 76 \ 3 \ 17 \\ 2 \\ \hline \end{array}$$

$$14 = \frac{1}{5})153 \ 3 \ 6$$

$$19 \ 0 \ 25 \frac{1}{2}$$

$$134 \ 2 \ 8 \frac{1}{2}$$

E

2. In

2. In 25 Barrels of Figs, each 2 cwt. 1 qr. Gross, Tare per Cent. 16 lb. how much neat Weight? *Answer*, 48 cwt. 0 qr. 24 lb.

3. What is the neat Weight of 9 Hogheads of Nutmegs, each weighing Gross 8 cwt, 3 qrs. 14 lb. Tare 16 lb. per Cent. *Answer*, 68 cwt. 1 qr. 24 lb.

4. What is the neat Weight of 12 Casks of Argol, Gross 84 cwt. 2 qrs. 14 lb. Tare per Cent. 14 lb. *Answer*, 74 cwt. 0 qr. 5 lb. $\frac{1}{2}$.

RULE 4. When Trett is allowed with Tare, divide the Pounds Suttle by 26, the Quotient is the Trett, which subtract from the Suttle, the Remainder is neat.

1. In 37 Butts of Currants, each 12 cwt. 2 qrs. 24 lb. Gross, Tare 14 lb. per Cent. Trett, 4 lb. per 104 lb. how many Pounds neat?

$$\begin{array}{r}
 12 \quad 2 \quad 24 \\
 4 \quad \quad \quad \\
 \hline
 50 \\
 28 \quad \quad \quad \\
 \hline
 14 = \frac{1}{2} 1424 \text{ Gross,} \\
 178 \text{ Tare,} \\
 \hline
 26) 1246 \text{ Suttle,} \\
 47 \text{ Trett,} \\
 \hline
 1199 \text{ Neat.}
 \end{array}$$

2. In 7 cwt. 3 qrs. 27 lb. Gross, Tare 36 lb. Trett 4 lb. per 104 lb. now many lb. Neat? *Answer*, 826 lb.

3. In 152 cwt. 1 qr. 9 lb. Gross, Tare 10 lb. per Cent. Trett 4 lb. per 104 lb. how much neat Weight? *Answer*, 133 cwt. 1 qr. 11 lb. $\frac{1}{2}$.

4. In 15 Chests of Sugar, weighing 117 cwt. 0 qr. 21 lb. Gross, Tare 173 lb. Trett 4 lb. per 104 lb. how many cwt. neat? *Answer*, 111 cwt. 0 qr. 22 lb.

RULE 5. When Cloff is allowed, multiply the cwt. Suttle by 2, divide the Product by 3, the Quotient will be the Pounds Cloff, which subtract from the Suttle, the Remainder will be neat.

1. What

ASSISTANT.

Reduction. 30

1. What is the neat Weight of 3 Hogheads of Tobacco, weighing 15 cwt. 3 qrs. 120 lb. Gross, Tare 7 lb. per Cent. Trett 4 lb. per 104, Cloff 2 lb. for 3 cwt.? *Answer,* 14 cwt. 1 qr. 3 lb.

$$7 = \frac{1}{16} \begin{array}{r} 15 \quad 3 \quad 20 \text{ Gross,} \\ 3 \quad 27 \frac{1}{2} \text{ Tare,} \end{array}$$

$$\frac{1}{16} \begin{array}{r} 14 \quad 3 \quad 20 \frac{1}{2} \text{ Suttle,} \\ 2 \quad 8 \text{ Trett,} \end{array}$$

$$\begin{array}{r} 14 \quad 1 \quad 12 \frac{1}{2} \text{ Suttle,} \\ 9 \frac{1}{2} \text{ Cloff,} \end{array}$$

$$\begin{array}{r} 14 \quad 1 \quad 3 \text{ Neat.} \end{array}$$

2. In 7 Hogheads of Tobacco, each weighing Gross 5 cwt. 2 qrs. 7 lb. Tare 8 lb. per Cent. Trett 4 lb. per 104 lb. Cloff 2 lb. per 3 cwt. how much neat Weight? *Answer,* 34 cwt. 2 qrs. 8 lb.

APOTHECARIES WEIGHT.

1. In 27 lb. 7 $\frac{3}{4}$ 2 3 1 $\emptyset$ 2 grs. how many Grains? *Answer* 159022.

3. How many lb. 3 3 $\emptyset$ and grs. are there in 159022 grs.? *Answer,* 27 lb. 7 $\frac{3}{4}$ 2 3 1 $\emptyset$ 2 grs.

CLOTH MEASURE.

1. In 27 Yards, how many Nails? *Answer,* 432.

2. In 75 Ells *English*, how many Yards? *Answer,* 93 yds. 3 qrs.

3. In 93 $\frac{1}{4}$ Yards, how many *English* Ells? *Answer,* 75.

4. In 24 Pieces, each containing 32 *Flemish* Ells, how many Ells *English*? *Answer,* 460 Ells, 4 qrs.

5. In 17 Pieces of Cloth, each 27 Ells *Flemish*, how many Yards? *Answer,* 344 Yards, 1 qr.

6. Bought 27 Pieces of *English* Stuffs, each 27 Ells, how many Yards? *Answer,* 911 Yards, 1 qr.

7. In 911 Yards, 1 Quarter, how many *English* Ells? *Answer,* 729.

8. In 12 Bales of Cloth, each 25 Pieces, each 15 Ells *English*, how many Yards? *Answer,* 5625.

LONG MEASURE.

1. In 57 Miles, how many Furlongs and Poles? *Answer, 456 Furlongs, 18240 Poles.*
2. In 7 Miles, how many Feet, Inches and Barley Corns? *Answer, 36960 Feet, 443520 Inches, 1330560 Barley Corns.*
3. In 18240 Poles, how many Furlongs and Miles? *Answer, 456 Furlongs, 57 Miles.*
4. In 72 Leagues, how many Yards? *Answer, 380160.*
5. In 380160 Yards, how many Miles and Leagues? *Answer, 216 Miles, 72 Leagues.*
6. If from London to York be accounted 50 Leagues, I demand how many Miles, Yards, Feet, Inches and Barley Corns? *Answer, 150 Miles, 264000 Yards, 792000 Feet, 9504000 Inches, 28512000 Barley Corns.*
7. How many Barley Corns will reach round the World? which is 360 Degrees, each Degree 69 Miles and an Half? *Answer, 4755801600 Barley Corns.*

LAND MEASURE.

1. In 27 Acres, how many Roods and Perches? *Answer, 108 Roods, 4320 Perches.*
2. In 4320 Perches, how many Acres? *Answer, 27.*
3. A Person having a Piece of Ground, containing 37 Acres, 1 Pole, has a Mind to dispose of 15 Acres to A, I desire to know how many Perches he will have left? *Answer, 3521.*
4. There are 4 Fields to be divided into Shares of 75 Perches each, the first Field containing 5 Acres, the second 4 Acres, 2 Poles, the third 7 Acres, 3 Roods, and the fourth 2 Acres, 1 Rood, I desire to know how many Shares are contain'd therein? *Answer, 40 Shares, 42 Perches.*

WINE MEASURE.

1. Bought 5 Tun of Port Wine, how many Gallons and Pints? *Answer, 1260 Gallons, 10080 Pints.*
2. In 10080 Pints, how many Tuns? *Answer, 5.*
3. In 5896 Gallons of Canary, how many Pipes and Hogshheads, and of each a like Number? *Answer, 31 each, 37 Gallons over.*

ASSISTANT.

Reduction. 45

4. A Gentleman ordered his Butler to bottle off $\frac{3}{4}$ of a Pipe of French Wine into Quarts, and the rest into Pints, I desire to know how many Dozen of each he had?
Answer, 28 Dozen of each.

A L E A N D B E E R.

1. In 46 Barrels of Beer, how many Pints? *Answer, 13248.*
2. In 10 Barrels of Ale, how many Gallons and Quarts? *Answer, 320 Gallons, 1280 Quarts.*
3. In 72 Hogsheads of Beer, how many Barrels? *Answer, 108 Barrels.*
4. In 108 Barrels of Beer, how many Hogsheads? *Answer, 72.*

D R Y M E A S U R E.

1. In 120 Quarters of Wheat, how many Bushels, Pecks, Gallons and Quarts? *Answer, 960 Bushels, 3840 Pecks, 7680 Gallons, 30720 Quarts.*
2. In 30720 Quarts of Corn, how many Quarters? *Answer, 120.*
3. In 20 Chaldron of Coals, how many Pecks? *Answer, 2880.*
4. In 273 Lasts of Corn, how many Pecks? *Answer, 87360.*

T I M E.

1. In 72015 Hours, how many Weeks. *Answer, 428 Weeks, 4 Days, 15 Hours.*
2. How many Days is it since the Birth of our Saviour to Christmas 1755; *Answer, 641013 Days, 18 Hours.*
Stowe writes, London was built 1108 Years before our Saviour's Birth, how many Hours is it since, to Christmas 1755. *Answer, 25097058 Hours.*
4. From the 17th of November, 1738, to the 12th of September, 1739, how many Days? *Answer 299.*
5. From the 18th of July 1749, to the 27th of December the same Year, how many Days? *Answer, 162 Days.*
6. From the 18th of July 1723, to the 18th of April 1750, how many Years and Days? *Answer, 26 Years, 9770 Days, reckoning 365 Days, 6 Hours, a Year.*

The SINGLE RULE of THREE DIRECT

TEACHETH by three Numbers given to find out a fourth, in such Proportion to the third, as the second is to the first.

RULE. First state your Question, *i. e.* place your Numbers in such Order, that the first and third be of one Kind, and the second the same as the Number required, then bring your first and third Numbers into one Name, and the second into its lowest Term mentioned. Multiply your second and third Numbers together, and divide the Product by the first, the Quotient will be the Answer to the Question in the same Denomination you left your second Number in.

EXAMPLES.

1. If 1 lb. of Sugar cost 4 d. $\frac{1}{2}$. what cost 54 lb.

$1 : 4 \frac{1}{2} :: 54$ Answer, 1 l. 0 s. 3 d.

4 18

18 4)972

12) 243

20 s. 3 d.

2. If a Gallon of Ale cost 3 d. what is that per Barrel? Answer, 8 s.

3. If 1 Pair of Shoes cost 4 s. 6 d. what will 12 Dozen come to? Answer, 32 l. 8 s.

4. If 12 Dozen Pair of Stockings cost 32 l. 8 s. what is that per Pair? Answer, 4 s. 6 d.

5. If 1 Yard of Cloth cost 15 s. 6 d. what will 32 Yards cost at the same Rate? Answer, 24 l. 16 s.

6. If 32 Yards of Cloth cost 24 l. 16 s. what is the Value of one Yard? Answer, 15 s. 6 d.

7. If 1 lb. of Sugar cost 10 d. $\frac{1}{2}$, what is the Worth of 1 cwt.? Answer, 4 l. 18 s.

8. If I gave 4 l. 18 s. for 1 cwt. of Sugar, at what Rate did I buy it at per lb.? Answer, 10 d. $\frac{1}{2}$.

9. If I buy 20 Pieces of Cloth, each 20 Ells, for 12 l. 6 d. per Ell, what is the Value of the Whole? Answer, 250 l.

10. Bought 20 Pieces of Holland, each 20 Ells, for 250 l. what is that per Ell? Answer, 12 s. 6 d.

11. What

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Num-
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e first,
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d.

Barrel?

Dozen

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at Rate

or 12

250

ills, for

Wh

11. What will 25 cwt. 3 qrs. 14 lb. of Tobacco come to at 15 d. $\frac{1}{2}$ per lb. Answer, 187 l. 3 s. 3 d.

12. Gave 187 l. 3 s. 3 d. for 25 cwt. 3 qrs. 14 lb. of Tobacco, at what Rate did I buy it at per lb.? Answer, 15 d. $\frac{1}{2}$.

13. Bought 27 Yards $\frac{1}{4}$ of Mullin at 6 s. 9 d. $\frac{1}{2}$ per Yard, what does it amount to? Answer, 9 l. 5 s. 0 d. $\frac{1}{2}$.

14. Bought 17 cwt. 1 qr. 14 lb. of Iron, at 3 d. $\frac{1}{2}$ per lb. what does it come to? Answer, 26 l. 7 s. 0 d. $\frac{1}{2}$.

15. If Coffee is sold for 5 d. $\frac{1}{2}$ per Ounce, what must be given for 2 cwt.? Answer, 82 l. 2 s. 8 d.

16. How many Yards of Cloth may be bought for 21 l. 11 s. 1 d. $\frac{1}{2}$, when 3 Yards $\frac{1}{2}$ cost 2 l. 14 s. 3 d. Answer, 27 yds. 3 qrs. 1 na. $\frac{42}{1302}$.

17. If 3 lb. $\frac{1}{2}$ of Cheshire Cheese cost 1 s. 1 d. what cost 1 cwt.? Answer, 1 l. 14 s. 8 d.

18. If 1 cwt. of Cheshire Cheese cost 1 l. 14 s. 8 d. what must I give for 3 lb. $\frac{1}{2}$? Answer, 1 s. 1 d.

19. Bought 1 cwt. 24 lb. 8 oz. of old Lead, at 9 s. per cwt. what does it come to? Answer, 10 s. 11 d. $\frac{1}{2}$. $\frac{112}{224}$.

20. If 1 cwt. 24 lb. 8 oz. of Lead be worth 10 s. 11 d. $\frac{1}{2}$. $\frac{112}{224}$. what is that per cwt.? Answer, 9 s.

21. If a Gentleman's Income is 500 l. a Year, and he spends 19 s. 4 d. per Day, how much does he lay by at the Year's End? Answer, 147 l. 3 s. 4 d.

22. If I buy 14 Yards of Cloth for 10 Guineas, how many Ells Flemish can I buy for 283 l. 17 s. 6 d. at the same Rate? Answer, 504 Fl. Ells, 2 qrs.

23. If 283 l. 17 s. 6 d. will buy 504 Flemish Ells, 2 Quarters, what Quantity of Yards can I have for 10 l. 10 s.? Answer, 14 yds.

24. If 504 Flemish Ells, 2 Quarters cost 283 l. 17 s. 6 d. at what Rate must I give for 14 Yards? Answer, 10 l. 10 s.

25. Gave 1 l. 1 s. 8 d. for 3 lb. of Coffee, what must be given for 29 lb. 4 oz. Answer, 10 l. 11 s. 3 d.

26. Bought 29 lb. 4 oz. of Coffee for 10 l. 11 s. 3 d. what is the Value of 3 lb. Answer, 1 l. 1 s. 8 d.

27. If 1 oz. $\frac{1}{2}$ of Coffee cost 6 d. $\frac{1}{2}$, what will 3 oz. $\frac{1}{4}$ cost at that Rate? Answer, 17 s. 1 d. $\frac{1}{2}$. $\frac{1}{2}$.

28. If 1 Ell English, 2 Quarters cost 4 s. 7 d. what will 39 Yards one half cost at the same Rate? Ans. 5 l. 3 s. 5 d. $\frac{1}{2}$. $\frac{1}{2}$.

29. If 1 Ounce of Gold is worth 5 l. 4 s. 2 d. what is the Worth of 1 Grain? Answer, 2 d. $\frac{1}{2}$. $\frac{29}{288}$.

30. If 14 Yards of Broad Cloth cost 9 l. 12 s. what would be the Purchase of 75 Yards? Answer, 51 l. 8 s. 6 d. $\frac{112}{224}$.

31. If

44 The Single Rule of Three Direct. The TUTOR

31. If 27 Yards of Holland cost 5 *l.* 12 *s.* 6 *d.* how many Ells *English* can I buy for 100 *l.* *Answer*, 384.

32. If 1 *cwt.* cost 12 *l.* 12 *s.* 6 *d.* what must I give for 14 *cwt.* 1 *qr.* 19 *lb.*? *Answer* 182 *l.* 0 *s.* 11 *d.* $\frac{5}{12}$.

33. Bought 7 Yards of Cloth for 17 *s.* 8 *d.* what must be given for 5 Pieces, each containing 27 Yards $\frac{1}{2}$? *Answer*, 17 *l.* 7 *s.* 0 *d.* $\frac{1}{4}$.

34. If 7 *oz.* 11 *dwt.* of Gold be worth 35 *l.* what is the Value of 14 *lb.* 9 *oz.* 12 *dwt.* 16 *gr.* at the same Rate? *Answer*, 823 *l.* 9 *s.* 3 *d.* $\frac{3}{4}$. $\frac{552}{384}$.

35. A Draper bought 420 Yards of Broad Cloth, at the Rate of 14 *s.* 10 *d.* $\frac{1}{2}$ per Ell *English*, how much did he pay for the Whole? *Answer*, 250 *l.* 5 *s.*

36. A Gentleman bought a Wedge of Gold, which weighed 14 *lb.* 3 *oz.* 8 *dwt.* for the Sum of 514 *l.* 4 *s.* at what Rate did he pay for it per Ounce? *Answer*, 3 *l.*

37. A Grocer bought 4 Hogsheads of Sugar, each weighing neat 6 *cwt.* 2 *qrs.* 14 *lb.* which cost him 2 *l.* 8 *s.* 6 *d.* per *cwt.* what is the Value of the 4 Hogsheads? *Answer*, 64 *l.* 5 *s.* 3 *d.*

38. A Draper bought 8 Packs of Cloth, each containing 4 Parcels, each Parcel 10 Pieces, and each Piece 26 Yards, and gave after the Rate of 4 *l.* 16 *s.* for 6 Yards, I desire to know what the 8 Packs stood him in? *Answer*, 6656 *l.*

39. If 24 *lb.* of Raisins cost 6 *s.* 6 *d.* what will 18 Fraills cost, each weighing neat 3 *qrs.* 18 *lb.*? *Answer*, 24 *l.* 17 *s.* 3 *d.*

40. If 1 *oz.* of Silver be worth 5 *s.* what is the Price of 14 Ingots, each weighing 7 *lb.* 5 *oz.* 10 *dwt.*? *Ans.* 313 *l.* 5 *s.*

41. What is the Price of a Pack of Wool weighing 2 *cwt.* 1 *qr.* 19 *lb.* at 8 *s.* 6 *d.* per Stone? *Answer*, 8 *l.* 4 *s.* 6 *d.* $\frac{1}{4}$. $\frac{10}{12}$.

42. Bought 59 *cwt.* 2 *qrs.* 24 *lb.* of Tobacco, at 2 *l.* 17 *s.* 4 *d.* per *cwt.* what does it come to? *Answer*, 171 *l.* 3 *s.* 7 *d.* $\frac{1}{4}$. $\frac{80}{112}$.

43. What is the half Year's Rent of 547 Acres of Land, at 15 *s.* 6 *d.* per Acre, per Annum? *Answer*, 211 *l.* 19 *s.* 3 *d.*

44. Bought 171 Ton of Lead, at 14 *l.* per Ton, paid Carriage, and other incident Charges, 4 *l.* 10 *s.* I require the Value of the Lead, and what it stands me in per *lb.* *Answer*, 2398 *l.* 10 *s.* Value. 1 *d.* $\frac{1}{2}$. $\frac{432}{384}$ per *lb.*

45. If 1 Pair of Stockings cost 10 Groats, how many Dozen may I buy for 43 *l.* 5 *s.*? *Answer*, 21 doz. 7 pa. $\frac{1}{2}$.

46. Bought 27 Dozen, 5 *lb.* of Candles, after the Rate of 17 *d.* per 3 *lb.* what did they cost me? *Answer*, 7 *l.* 15 *s.* 4 *d.* $\frac{1}{4}$.

47. If

ASSISTANT. *The Single Rule of Three Inverse.* 45

47. If an Ounce of fine Gold be sold for 3*l.* 10*s.* what comes 7 Ingots to, each weighing 3*lb.* 7*oz.* 14*dwt.* 21*gr.* at the same Price? *Answer* 1071*l.* 14*s.* 5*d.* $\frac{1}{4}$.

48. If my Horse stands me in 9*d.* $\frac{1}{2}$ per Day keeping; what will be the Charge of 11 Horses for the Year? *Answer*, 158*l.* 18*s.* 6*d.* $\frac{1}{2}$.

49. A Factor bought 86 Pieces of Stuff, which cost him 517*l.* 19*s.* 4*d.* at 4*s.* 10*d.* per Yard, I demand how many Yards there were, and how many Ells *English*, in one Piece? *Answer*, 2143 yds. $\frac{1}{4}$. $\frac{7}{8}$. and 19 ells, 4 qrs. $\frac{6}{8}$ in a Piece.

50. A Gentleman hath an Annuity of 896*l.* 17*s.* per Annum, I desire to know how much he may spend daily, that at the Year's End he may lay up 200 Guineas, and give to the Poor quarterly 10 Moidores? *Ans.* 1*l.* 14*s.* 8*d.* $\frac{4}{5}$.

The RULE of THREE INVERSE.

INVERSE PROPORTION is, when *more* requires *less*, and *less* requires *more*. *More* requires *less*, is when the third Term is *greater* than the *first*, and requires the *fourth* Term to be *less* than the *second*. And *less* requires *more*, is when the *third* Term is *less* than the *first*, and requires the *fourth* Term to be *greater* than the *second*.

RULE. Multiply the first and the second Terms together, and divide the Product by the third, the Quotient will bear such Proportion to the second as the first does to the third.

EXAMPLES.

1. If 8 Men can do a Piece of Work in 12 Days, how many Days can 16 Men perform the same in? *Answer*, 6 days.

$$8 : 12 :: 16 : 6$$

8

—
16)96(6 Days

2. If 54 Men can build a House in 90 Days, how many Men can do the same in 50 Days? *Answer*, 97 Men.

3. If when a Peck of Wheat is sold for 2*s.* the Penny Loaf weighs 8*oz.* how much will it weigh when the Peck is worth but 1*s.* 6*d.*? *Answer*, 10*oz.* 13*dwt.* 8*gr.*

4. How many Pieces of Money of 20*s.* Value are equal to 240 Pieces of 12*s.* each? *Answer*, 144.

5. How

40 The Single Rule of Three Inverse. The Tutor's

5. How many Yards of 3 Quarters wide are equal in Measure to 30 Yards of 5 Quarters wide? *Answer* 50.

6. If I lend my Friend 200*l.* for 12 Months, how long ought he to lend me 150*l.* to requite my Kindness? *Answer*, 16 Months.

7. If for 24*s.* I have 1200*lb.* carried 36 Miles, how many Pounds can I have carried 24 Miles for the same Money? *Answer*, 1800*lb.*

8. If 100 Workmen finish a Piece of Work in 12 Days, how many are sufficient to do it in 3 Days? *Answer*, 400.

9. An Army besieging a Town, in which were 1000 Soldiers, with Provisions for 3 Months, how many Soldiers departed when the Provisions lasted them 6 Months? *Answer*, 500.

10. If 20*l.* worth of Wine is sufficient to serve an Ordinary of 100 Men, when the Tun is sold for 30*l.* how many will 20*l.* worth suffice, when the Tun is sold for but 24*l.* *Answer*, 125 Men.

11. A Courier makes a Journey in 24 Days, when the Day is but 12 Hours long, how many Days will he be going the same Journey, when the Days are 16 Hours long? *Answer*, 18 Days.

12. How much Plush is sufficient for a Cloak, which has in it 4 Yards of 7 Quarters wide of Stuff for the Lining, the Plush being but 3 Quarters wide? *Ans.* 9 yds. $\frac{7}{8}$.

13. If 14 Pioneers make a Trench in 18 Days, how many Days will 34 take to do the same? *Ans.* 7 Days, 4 Hours, 56 Min. $\frac{16}{34}$.

14. Borrowed of my Friend 64*l.* for 8 Months, and he hath Occasion another Time to borrow of me for 12 Months, how much must I lend him to requite his former Kindness to me? *Answer*, 42*l.* 13*s.* 4*d.*

15. A Regiment of Soldiers consisting of 1000 Men are to have new Coats, each Coat to contain 2 Yards $\frac{1}{2}$ of Cloth 5 Quarters wide, and to be lined with Shalloon of 3 Quarters wide, I demand how many Yards of Shalloon will line them? *Answer*, 4166 yards, 2 qrs. 2 na. $\frac{3}{4}$.

The DOUBLE RULE of THREE.

IS so called, because it is composed of 5 Numbers given to find a sixth, which if the Proportion is *direct*, must bear such Proportion to the 4th and 5th, as the 3d bears to the 1st and 2d. But if *inverse*, the 6th Term must bear such Proportion to the 4th and 5th, as the 1st bears to the 2d and 3d. The three first Terms are a Supposition, the two last a Demand.

RULE 1. Let the principal Cause of *Loss* or *Gain*, *Intérest* or *Decrease*, *Action* or *Passion*, be put in the first Place.

2. Let that which betokeneth *Time*, *Distance* of Place, and the like, in the second Place, and the remaining one in the third.

3. Place the other two Terms under their like in the Supposition.

4. If the *Blank* falls under the *third* Term, multiply the first and second Terms for a *Divisor*, and the other three for *Dividend*. But,

5. If the *Blank* falls under the *first* or *second* Term, multiply the *third* and *fourth* Terms for a *Divisor*, and the other three for a *Dividend*, and the *Quotient* will be the *Answer*.

PROOF by two single Rules of Three,

EXAMPLES.

1. If 14 Horses eat 56 Bushels of Oats in 16 Days, how many Bushels will be sufficient for 20 Horses 24 Days?

By two single Rules,				or in one Stating.			Worked thus.
Hor.	Bu.	Hor.	Bu.	Ho.	Days.	Bu.	
As 14 :	56 ::	20 :	80	} 14 : 16 : 56	20 : 24 : -	56 x 20 x 24	= 120
Days.	Bu.	Days.	Bu.				
As 16 :	80 ::	24 :	120				14 x 16

2. If 8 Men in 14 Days can mow 112 Acres of Grass, how many Men must there be to mow 2000 Acres in 10 Days?

Acres. Days. Acres. Days.				} M. D. Acres.	
As 112 :	14 ::	2000 :	250		8 : 14 : 112
Days.	Men.	Days.	Men.		
As 250 :	8 ::	10 :	200	- : 10 : 2000	112 × 10
					= 200

3. If 100 l. in 12 Months gain 6 l. Intérest, how much 75 l. gain in 9 Months? Answer, 3 l. 7 s. 6 d.

4. IF

4. If a Carrier receives 2*l.* 2*s.* for the Carriage of 3 *cwt.* 150 Miles, how much ought he to receive for the Carriage of 7 *cwt.* 3*qrs.* 14*lb.* 50 Miles? *Answer*, 1*l.* 16*s.* 9*d.*

5. If a Regiment of Soldiers, consisting of 136 Men, consume 351 Quarters of Wheat in 108 Days, how many Quarters of Wheat will 11232 Soldiers consume in 56 Days? *Answer*, 15031.

6. If 40 Acres of Grass be mowed by 8 Men in 7 Days, how many Acres can be mowed by 24 Men in 28 Days? *Answer*, 480.

7. If 40 Shillings will pay 8 Men for 5 Days Work, how much will pay 32 Men for 24 Days Work? *Answer*, 38*l.* 8*s.*

8. If 100*l.* in 12 Months gain 6*l.* Interest, what Principal will gain 3*l.* 7*s.* 6*d.* in 9 Months? *Answer* 75*l.*

9. If a Regiment consisting of 939 Soldiers consume 351 Quarters of Wheat in 168 Days, how many Soldiers will consume 1404 Quarters in 56 Days? *Answer*, 11268.

10. In a Family consisting of 7 Persons, there are drank out 2 Kilderkins of Beer in 12 Days, how many Kilderkins will there be drank out by another Family of 14 Persons in 8 Days? *Answer*, 2 *kil.* 12 *gal.*

11. If the Carriage of 60 *cwt.* 20 Miles cost 14*l.* 10*s.* what Weight can I have carried 30 Miles for 5*l.* 8*s.* 9*d.* at the same Rate of Carriage? *Answer*, 15 *cwt.*

12. If 2 Horses eat 8 Bushels of Oats in 16 Days, how many Horses will eat up 3000 Quarters in 24 Days? *Answer*, 4000.

13. If 100*l.* in 12 Months gain 7*l.* Interest, what is the Interest of 571*l.* for 6 Years? *Ans.* 239*l.* 16*s.* 4*d.* $\frac{1}{2}$.

14. If I pay 10*s.* for the Carriage of 2 *Ton* 6 Miles, what must I pay for the Carriage of 12 *Ton* 17 *Cwt.* 17 Miles? *Answer*, 9*l.* 2*s.* 0*d.* $\frac{1}{2}$.

P R A C T I C E

IS so call'd from the general Use thereof by all Persons concerned in Trade and Business.

All Questions in this Rule are performed by taking aliquot or even Parts, by which Means many tedious Reductions are avoided, the Table of which is as follows :

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Days?
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Days?
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ASSISTANT.

Practice. 49

Of a Pound.	Of a Shilling.	Of a Ton.	Of an Hundred.
d.	d.	cut.	qrs. lb.
0 - is - $\frac{1}{2}$	6 - is - $\frac{1}{2}$	10 - is - $\frac{1}{2}$	2 or 56 is $\frac{1}{2}$
6 8 - - $\frac{1}{4}$	4 - - - $\frac{1}{4}$	5 - - - $\frac{1}{4}$	1 or 28 - $\frac{1}{4}$
5 - - - $\frac{1}{4}$	3 - - - $\frac{1}{4}$	4 - - - $\frac{1}{4}$	14 - $\frac{1}{8}$
4 - - - $\frac{1}{4}$	2 - - - $\frac{1}{4}$	2 $\frac{1}{2}$ - - $\frac{1}{8}$	Of a Quarter.
3 4 - - $\frac{1}{8}$	1 $\frac{1}{2}$ - - $\frac{1}{8}$	2 - - - $\frac{1}{16}$	14 - - $\frac{1}{16}$
2 6 - - $\frac{1}{8}$	1 - - - $\frac{1}{12}$		7 - - $\frac{1}{16}$
2 - - - $\frac{1}{8}$			4 - - $\frac{1}{16}$
1 8 - - $\frac{1}{12}$			3 $\frac{1}{2}$ - - $\frac{1}{16}$

RULE 1. When the Price is less than a Penny, divide by the aliquot Parts that are in a Penny, then by 12 and 20, it will give the Answer.

is $\frac{1}{4}$ 5704 lb. at $\frac{1}{4}$	7695 at $\frac{1}{2}$	6547 at $\frac{1}{4}$
12)1426	Facit l. 16. 0. 7. $\frac{1}{2}$	Facit l. 20. 9. 2. $\frac{1}{4}$
2)011 8.10	5740 at $\frac{1}{2}$	4573 at $\frac{1}{4}$
l. 5. 18. 10.	Facit l. 11. 19. 2.	Facit l. 14. 5. 9. $\frac{1}{2}$

RULE 2. When the Price is less than a Shilling take the aliquot Part or Parts that are in a Shilling, add them together and divide by 20, as before.

is $\frac{1}{12}$ 7547 at 1 d.	6254 at 1 d. $\frac{1}{4}$	7062 at 3 d. $\frac{1}{4}$
2)062 8.11	Facit l. 45. 12. 0. $\frac{1}{2}$	Facit l. 95. 12. 7. $\frac{1}{2}$
l. 31. 8. 11.	2351 at 2 d.	2147 at 3 d. $\frac{1}{2}$
	Facit l. 19. 11. 10.	Facit l. 31. 6. 2. $\frac{1}{2}$
is $\frac{1}{12}$ 3751 at 1 $\frac{1}{4}$	7210 at 2 $\frac{1}{4}$	7000 at 3 d. $\frac{1}{4}$
$\frac{1}{4}$ is $\frac{1}{4}$ 312.7	Facit l. 67. 11. 10. $\frac{1}{2}$	Facit l. 109. 7. 6.
78.1 $\frac{1}{4}$	2710 at 2 d. $\frac{1}{2}$	3257 at 4 d.
2)039 0.8 $\frac{1}{4}$	Facit l. 28. 4. 7.	Facit l. 54. 5. 8.
l. 19. 10. 8. $\frac{1}{4}$	3250 at 2 d. $\frac{1}{4}$	2056 at 4 d. $\frac{1}{4}$
	Facit l. 37. 4. 9. $\frac{1}{2}$	Facit l. 36. 8. 2.
54325 at 1 d. $\frac{1}{2}$	2715 at 3 d.	3752 at 4 d. $\frac{1}{2}$
Facit l. 339. 10. 7. $\frac{1}{2}$	Facit l. 33. 18. 9.	Facit l. 70. 7. 0.

50 Practice.

The TUTOR

2107 at 4 d. $\frac{1}{2}$. Facit l. 41. 14. 0. $\frac{1}{2}$	3254 at 7 d. $\frac{1}{2}$. Facit l. 98. 5. 11. $\frac{1}{2}$	2150 at 9 d. $\frac{1}{2}$. Facit l. 87. 6. 10. $\frac{1}{2}$
3210 at 5 d. Facit l. 66. 17. 6.	2701 at 7 d. $\frac{1}{2}$. Facit l. 84. 8. 1. $\frac{1}{2}$	6325 at 10 d. Facit l. 263. 10. 10.
2715 at 5 d. $\frac{1}{2}$. Facit l. 59. 7. 9. $\frac{1}{2}$	3714 at 7 d. $\frac{1}{2}$. Facit l. 119. 18. 7. $\frac{1}{2}$	5724 at 10 d. $\frac{1}{2}$. Facit l. 244 9. 3.
3120 at 5 d. $\frac{1}{2}$. Facit l. 71. 10.	2710 at 8 d. Facit l. 90. 6. 8.	6327 at 10 d. $\frac{1}{2}$. Facit l. 270. 4. 3. $\frac{1}{2}$
7521 at 5 d. $\frac{1}{2}$. Facit l. 180. 3. 9. $\frac{1}{2}$	3514 at 8 d. $\frac{1}{2}$. Facit l. 120. 15. 10. $\frac{1}{2}$	3254 at 10 d. $\frac{1}{2}$. Facit l. 142. 7. 3.
3271 at 6 d. Facit l. 81. 15. 6.	2759 at 8 d. $\frac{1}{2}$. Facit l. 97. 14. 3. $\frac{1}{2}$	7291 at 10 d. $\frac{1}{2}$. Facit l. 326. 11. 6. $\frac{1}{2}$
7914 at 6 d. $\frac{1}{2}$. Facit l. 206. 1. 10. $\frac{1}{2}$	9872 at 8 d. $\frac{1}{2}$. Facit l. 359. 18. 4.	3256 at 11 d. Facit l. 149. 4. 8.
3250 at 6 d. $\frac{1}{2}$. Facit l. 88. 0. 5.	5272 at 9 d. Facit l. 197. 14.	7254 at 11 d. $\frac{1}{2}$. Facit l. 340. 0. 7. $\frac{1}{2}$
2708 at 6 d. $\frac{1}{2}$. Facit l. 76. 3. 3.	6325 at 9 d. $\frac{1}{2}$. Facit l. 243. 15. 6. $\frac{1}{2}$	3754 at 11 d. $\frac{1}{2}$. Facit l. 179. 17. 7. $\frac{1}{2}$
3271 at 7 d. Facit l. 95. 8. 1.	7924 at 9 d. $\frac{1}{2}$. Facit l. 313. 13. 2.	7972 at 11 d. $\frac{1}{2}$. Facit l. 390. 5. 11. $\frac{1}{2}$

RULE 3. When the Price is more than a Shilling, and less than two, take the Part or Parts with so much of the given Price as is more than a Shilling, which add to the given Quantity, and divide by 20, it will give the Answer.

$\frac{1}{2} \frac{1}{4}$ 2106 at 12 d. $\frac{1}{2}$. 43 10 $\frac{1}{2}$	$\frac{1}{2} \frac{1}{4}$ 3715 at 12 d. $\frac{1}{2}$. 154 9 $\frac{1}{2}$	2712 at 12 d. $\frac{1}{2}$. Facit l. 144. 1. 6. $\frac{1}{2}$
2 0)214 9 10 $\frac{1}{2}$	2 0)386 9 9 $\frac{1}{2}$	2107 at 15. 1 d. Facit l. 114. 2. 7. $\frac{1}{2}$
l. 107. 9. 10. $\frac{1}{2}$.	l. 193 9. 9. $\frac{1}{2}$.	

3215 at 1 s. 1 d. $\frac{3}{4}$. Facit l. 177. 9. 10. $\frac{3}{4}$	3725 at 1 s. 5 d. $\frac{1}{4}$. Facit l. 263. 17. 1.	1004 at 1 s. 8 d. $\frac{3}{4}$. Facit l. 86. 16. 1.
2790 at 1 s. 1 d. $\frac{1}{2}$. Facit l. 156. 18. 9.	7250 at 1 s. 5 d. $\frac{1}{4}$. Facit l. 521. 1. 10. $\frac{1}{2}$	2104 at 1 s. 9 d. $\frac{1}{2}$. Facit l. 184. 2.
7904 at 1 s. 1 d. $\frac{3}{4}$. Facit l. 452. 16. 8.	2597 at 1 s. 5 d. $\frac{1}{2}$. Facit l. 189. 7. 3. $\frac{1}{2}$	2571 at 1 s. 9 d. $\frac{1}{4}$. Facit l. 227. 12. 9. $\frac{3}{4}$
3750 at 1 s. 1 d. $\frac{1}{2}$. Facit l. 218. 15.	7210 at 1 s. 5 d. $\frac{3}{4}$. Facit l. 533. 4. 9. $\frac{1}{2}$	2104 at 1 d. 9 d. $\frac{1}{2}$. Facit l. 188. 9. 8.
3291 at 1 s. 2 d. $\frac{1}{4}$. Facit l. 195. 8. 0. $\frac{3}{4}$	7524 at 1 s. 6 d. $\frac{1}{2}$. Facit l. 564. 6.	7506 at 1 s. 9 d. $\frac{1}{4}$. Facit l. 680. 4. 7. $\frac{1}{2}$
9254 at 1 s. 2 d. $\frac{3}{4}$. Facit l. 559. 1. 11.	7103 at 1 s. 6 d. $\frac{1}{4}$. Facit l. 540. 2. 5. $\frac{3}{4}$	1071 at 1 s. 10 d. $\frac{1}{2}$. Facit l. 98. 3. 6.
7250 at 1 s. 2 d. $\frac{3}{4}$. Facit l. 445. 11. 5. $\frac{1}{2}$	3254 at 1 s. 6 d. $\frac{1}{2}$. Facit l. 250. 16. 7.	5200 at 1 s. 10 d. $\frac{3}{4}$. Facit l. 482. 1. 8.
7591 at 1 s. 3 d. $\frac{1}{2}$. Facit l. 474. 8. 9.	7925 at 1 s. 6 d. $\frac{3}{4}$. Facit l. 619. 2. 9. $\frac{1}{4}$	2117 at 1 s. 10 d. $\frac{1}{4}$. Facit l. 198. 9. 4. $\frac{1}{2}$
6325 at 1 s. 3 d. $\frac{1}{4}$. Facit l. 401. 18. 0. $\frac{3}{4}$	9271 at 1 s. 7 d. $\frac{1}{2}$. Facit l. 733. 19. 1.	1007 at 1 s. 10 d. $\frac{3}{4}$. Facit l. 95. 9. 1. $\frac{1}{4}$
5271 at 1 s. 3 d. $\frac{1}{2}$. Facit l. 340. 8. 4. $\frac{1}{2}$	7210 at 1 s. 7 d. $\frac{1}{4}$. Facit l. 578. 6. 0. $\frac{1}{2}$	5000 at 1 s. 11 d. $\frac{1}{2}$. Facit l. 479. 3. 4.
3254 at 1 s. 3 d. $\frac{3}{4}$. Facit l. 213. 10. 10. $\frac{1}{2}$	2310 at 1 s. 7 d. $\frac{1}{2}$. Facit l. 187. 13. 9.	2105 at 1 s. 11 d. $\frac{1}{4}$. Facit l. 203. 18. 5. $\frac{3}{4}$
2915 at 1 s. 4 d. $\frac{1}{2}$. Facit l. 194. 6. 8.	2504 at 1 s. 7 d. $\frac{3}{4}$. Facit l. 206. 1. 2.	1006 at 1 s. 11 d. $\frac{1}{2}$. Facit l. 98. 10. 1.
3270 at 1 s. 4 d. $\frac{3}{4}$. Facit l. 221. 8. 1. $\frac{1}{2}$	7152 at 1 s. 8 d. $\frac{1}{2}$. Facit l. 596.	2705 at 1 s. 11 d. $\frac{1}{4}$. Facit l. 267. 13. 7. $\frac{3}{4}$
7059 at 1 s. 4 d. $\frac{1}{2}$. Facit l. 485. 6. 1. $\frac{1}{2}$	2905 at 1 s. 8 d. $\frac{3}{4}$. Facit l. 245. 2. 2. $\frac{1}{4}$	5000 at 1 s. 11 d. $\frac{1}{2}$. Facit l. 9791. 8.
2750 at 1 s. 4 d. $\frac{3}{4}$. Facit l. 191. 18. 6. $\frac{1}{2}$	7104 at 1 s. 8 d. $\frac{1}{4}$. Facit l. 606. 16.	4000 at 1 s. 11 d. $\frac{3}{4}$. Facit l. 7916. 8.

RULE 4. When the *Price* consists of any even Number of *Shillings* under 20, multiply the given *Quantity* by Half the *Price*, doubling the first Figure of the Product for *Shillings*, and the rest of the Product will be *Pounds*.

2750 at 2 s.
Facit l. 275. 0.

2102 at 10 s.
Facit l. 1051.

1075 at 16 s.
Facit l. 860.

3254 at 4 s.
Facit l. 650. 16.

2101 at 12 s.
Facit l. 1260. 12.

1621 at 18 s.
Facit l. 1458. 18.

2710 at 6 s.
Facit l. 813. 0.

5271 at 14 s.
Facit l. 3689. 14.

Note, When the *Price* is 10 s. take Half of the *Quantity*, and if any remains, it is 10 s.

1572 at 8 s.
Facit l. 628. 16.

3123 at 16 s.
Facit l. 2498 8.

RULE 5. When the *Price* consists of odd *Shillings*, multiply the given *Quantity* by the *Price*, and divide by 20, the Product will be the *Answer*.

2703 at 1 s.
Facit l. 135. 3.

2715 at 7 s.
Facit l. 950. 5.

2150 at 15 s.
Facit l. 1612. 10.

3270 at 3 s.
3

3214 at 9 s.
Facit l. 1446. 6.

3142 at 17 s.
Facit l. 2670. 14.

2|0)981|0

2710 at 11 s.
Facit l. 1490. 10.

2150 at 19 s.
Facit l. 2042. 10.

l. 490. 10.

3271 at 5 s.
Facit l. 817. 15.

3179 at 13 s.
Facit l. 2066. 7.

7157 at 19 s.
Facit l. 6799. 3.

RULE 6. When the *Price* is *Shillings* and *Pence*, and they the Aliquot Part of a *Pound*, divide by the Aliquot Part, and it will give the *Answer* at once; but if they are not an Aliquot Part, then multiply the *Quantity* by the *Shillings*, and take Parts for the rest, add them together, and divide by 20.

68 $\frac{1}{2}$	2710 at 6 s. 8 d.
	903 l. 6. 8.
	3150 at 3 s. 4 d.
	Facit l. 525.
	2715 at 2 s. 6 d.
	Facit l. 339. 7. 6.
	7150 at 1 s. 8 d.
	Facit l. 595. 16. 8.
	3215 at 1 s. 4 d.
	Facit l. 214. 6. 8.
	7211 at 1 s. 3 d.
	Facit l. 450. 13. 9.
2 $\frac{1}{8}$	2710 at 3 s. 2 d.
	3
	8130
	451. 8
	858 l. 1 s. 8 d.
	429 l. 1 s. 8 d.
	7514 at 4 s. 7 d.
	Facit l. 1721. 19. 2.

2537 at 5 s. 3 d.
Facit l. 660. 14. 3.
2547 at 7 s. 3 d. $\frac{1}{2}$.
Facit l. 928. 11. 10. $\frac{1}{2}$.
3271 at 5 s. 9 d. $\frac{1}{4}$.
Facit l. 943. 16. 4. $\frac{1}{4}$.
2103 at 15 s. 4 d. $\frac{1}{2}$.
Facit l. 1616. 13. 7. $\frac{1}{2}$.
7152 at 17 s. 6 d. $\frac{3}{4}$.
Facit l. 6280. 7.
2510 at 14 s. 7 d. $\frac{1}{4}$.
Facit l. 1832. 16. 5. $\frac{1}{2}$.
3715 at 9 s. 4 d. $\frac{1}{2}$.
Facit l. 1741. 8. 1. $\frac{1}{4}$.
2572 at 13 s. 7 d. $\frac{1}{2}$.
Facit l. 1752. 3. 6.
7251 at 14 s. 8 d. $\frac{1}{2}$.
Facit l. 5324. 19. 0. $\frac{1}{2}$.
3210 at 15 s. 7 d. $\frac{1}{2}$.
Facit l. 2511 3. 1. $\frac{1}{2}$.
2710 at 19 s. 2 d. $\frac{1}{2}$.
Facit l. 2602. 14. 7.

RULE 7. 1st. When the Price is Pounds and Shillings, multiply the Quantity by the Pounds, and proceed with the Shillings, if they are even, as in the 4th Rule, if odd, take the Aliquot Parts, add them together, the Sum will be the Answer. 2dly. When Pounds, Shillings, and Pence, and the Shillings and Pence the aliquot Part of a Pound, multiply the Quantity by the Pounds, and take Parts for the rest. 3dly. When the Price is Pounds, Shillings, Pence and Farthings, and the Shillings and Pence not the Aliquot Parts of a Pound, reduce the Pounds and Shillings into Shillings, multiply

54. Practice.

The Tutor's

tiplly the Quantity by the *Shillings*, take Parts for the rest, add them together, and divide by 20.

Note. When the given Quantity is no more than three Figures, proceed as in Compound Multiplication.

4	$\frac{1}{3}$	7215 at 7 l. 4 s.
		7
		50505
		1443
		51948 l.
s.d.		
2-6	$\frac{1}{4}$	2104 at 5 l. 3 s.
		5
		10520
		263
		52. 12
		10835 12
		2107 at 2 l. 8 s.
		Facit l. 5056. 16.
		7156 at 5 l. 6 s.
		Facit l. 37926. 16.
6	$\frac{1}{2}$	
		2710 at 2 l. 3 s. 7 d. $\frac{1}{2}$
		43
d.		
1	$\frac{1}{2}$ $\frac{1}{4}$	116530
		1355
		338.9
		11822 3.9
		5911. 3. 9.
		3215 at 1 l. 17 s.
		Facit l. 5947. 15.

2107 at 1 l. 13 s.
Facit l. 3476. 11.
3215 at 4 l. 6 s. 8 d.
Facit l. 13931. 13. 4.
2154 at 7 l. 1 s. 3 d.
Facit l. 15212. 12. 6.
2701 at 2 l. 3 s. 4 d.
Facit l. 5852. 3. 4.
2715 at 1 l. 17 s. 2 d. $\frac{1}{2}$
Facit l. 5051. 0. 7. $\frac{1}{2}$
2157 at 3 l. 15 s. 2 d. $\frac{1}{4}$
Facit l. 8108. 19. 5. $\frac{1}{4}$
3210 at 1 l. 18 s. 6 d. $\frac{1}{4}$
Facit l. 6189. 5. 7. $\frac{1}{4}$
2157 at 2 l. 7 s. 4 d. $\frac{1}{2}$
Facit l. 5109. 7. 10. $\frac{1}{2}$
142 at 1 l. 15 s. 2 d. $\frac{1}{4}$
Facit l. 250. 2. 6. $\frac{1}{2}$
95 at 15 l. 14 s. 7 d. $\frac{1}{4}$
Facit l. 1494. 7. 4. $\frac{1}{4}$
37 at 1 l. 19 s. 5 d. $\frac{3}{4}$
Facit l. 73. 0. 8. $\frac{3}{4}$
2175 at 2 l. 15 s. 4 d. $\frac{1}{5}$
Facit l. 6022. 0. 7. $\frac{1}{2}$
2150 at 17 l. 16 s. 1 d. $\frac{1}{2}$
Facit l. 38283. 8. 9.

RULE

RULE 8. When the *Price* and *Quantity* given are of several *Denominations*, multiply the *Price* by the *Integers*, and take *Parts* with the *Parts* of the *Integer* for the rest.

At 3 l. 17 s. 6 d. per *Cwt.* what is the Value of 25 *cwt.* 2 *qrs.* 14 lb. of Tobacco?

qrs.

2	$\frac{1}{2}$	3 l. 17 s. 6 d.	$5 \times 5 = 25$
		<u>5</u>	
		19 . 7 . 6	
		<u>5</u>	
lb.		96 . 17 . 6	
14	$\frac{1}{4}$	1 . 18 . 9	
		9 . 8 . $\frac{1}{4}$	
		<u> </u>	
		99 . 5 . 11 . $\frac{1}{4}$	

2. At 1 l. 4 s. 9 d. per *cwt.* what comes 17 *cwt.* 1 *qr.* 17 lb. of Cheese to? *Answer*, 21 l. 10 s. 8 d.

3. Sold 85 *cwt.* 1 *qr.* 10 lb. of Cheese at 1 l. 7 s. 8 d. per *cwt.* what does it come to? *Answer*, 118 l. 1 s. 0 d. $\frac{1}{2}$.

4. Hops at 4 l. 5 s. 8 d. per *cwt.* what must be given for 72 *cwt.* 1 *qr.* 18 lb.? *Answer*, 310 l. 3 s. 2 d.

5. At 1 l. 1 s. 4 d. per *cwt.* what is the Value of 27 *cwt.* 2 *qrs.* 15 lb. of Malaga Raisins? *Answer*, 29 l. 9 s. 6 d. $\frac{1}{4}$.

6. Bought 78 *cwt.* 3 *qrs.* 12 lb. of Currants, at 2 s. 17 s. 9 d. per *cwt.* what did I give for the Whole? *Answer*, 227 l. 14 s.

7. Sold 56 *cwt.* 1 *qr.* 17 lb. of Sugar, at 2 l. 15 s. 9 d. the *cwt.* what does it come to? *Answer*, 157 l. 4 s. 4 d. $\frac{1}{2}$.

8. Tobacco at 3 l. 17 s. 10 d. the *cwt.* what is the Worth of 97 *cwt.* 0 *qrs.* 15 lb.? *Answer*, 378 l. 0 s. 3 d.

9. At 4 l. 14 s. 6 d. the *cwt.* what is the Value of 37 *cwt.* 2 *qrs.* 13 lb. of double refined Sugar? *Answer*, 177 l. 14 s. 8 d. $\frac{1}{2}$.

10. Bought Sugar at 3 l. 14 s. 6 d. the *cwt.* what did I give for 15 *cwt.* 1 *qr.* 10 lb.? *Answer*, 57 l. 2 s. 9 d.

11. At 4 l. 15 s. 4 d. the *cwt.* the Value of 172 *cwt.* 3 *qrs.* 12 lb. of Tobacco is required? *Answer*, 823 l. 19 s. $\frac{1}{2}$.

12. Soap at 3 l. 11 s. 6 d. the *cwt.* what is the Value of 53 *cwt.* 0 *qrs.* 17 lb.? *Answer*, 190 l. 0 s. 4 d.

I N T E R E S T.

INTEREST is either *Simple* or *Compound*.

S I M P L E I N T E R E S T

IS the PROFIT allowed in the lending or Forbearance of any Sum of Money for a determined Space of Time.

The PRINCIPAL is the Money lent, for which Interest is to be received.

The RATE per CENT. is a certain Sum agreed on between the Borrower and the Lender, to be paid for every 100*l.* for the Use of the Principal, 12 Months.

The AMOUNT is the Principal and Interest added together.

Interest is also applied to Commission, Brokage, Purchasing of Stocks and Insurance.

To find the Interest of any Sum of Money for a Year.

RULE 1. Multiply the Principal by the Rate per Cent. that Product divided by 100, will give the Interest requir'd.

For several Years.

Multiply the Interest of one Year by the Number of Years given in the Question, and the Product will be the Answer.

E X A M P L E S.

1. What is the Interest of 375*l.* for a Year, at 5*l.* per Cent. per Annum?

$$\begin{array}{r} 5 \\ \hline 18 \overline{) 75} \\ 20 \\ \hline 15 \overline{) 00} \end{array}$$

Answer, 18*l.* 15*s.*

2. What is the Interest of 268*l.* for one Year at 4*l.* per Cent. per Annum? Answer 10*l.* 14*s.* 4*d.* $\frac{3}{4}$.

3. What is the Interest of 945*l.* 10*s.* for a Year, at 4*l.* per Cent. per Annum? Answer, 37*l.* 16*s.* 4*d.* $\frac{3}{4}$.

4. What is the Interest of 547*l.* 15*s.* at 5*l.* per Cent. per Annum, for 3 Years? Answer, 82*l.* 3*s.* 3*d.*

5. What is the Interest of 254*l.* 17*s.* 6*d.* for 5 Years, at 4*l.* per Cent. per Annum? Answer, 50*l.* 19*s.* 5*d.* $\frac{1}{2}$.
6. What is the Interest of 556*l.* 13*s.* 4*d.* at 5 per Cent. per Annum, for 5 Years? Answer, 139*l.* 3*s.* 4*d.*

COMMISSION

Is an Allowance from Merchants to their Factors or Correspondents in the buying or selling of Goods, and is generally at a certain Rate per Cent. according to the Custom of the Country, where the Factor resides.

RULE. Multiply the Principal by the Rate per Cent. as before; and for $\frac{1}{2}$, $\frac{1}{4}$, or $\frac{1}{8}$, take the Part or Parts from the Principal, which add to the Product, and divide by 100, will give the Answer.

7. What is the Commission of 287*l.* 10*s.* at 3 $\frac{1}{2}$ per Cent.?

$$\begin{array}{r} \frac{1}{2} \frac{1}{2} \quad 287 \cdot 10 \\ \hline 3 \end{array}$$

Answer, 10*l.* 1*s.* 3*d.*

$$862 \cdot 10 = 3$$

$$143 \cdot 15 =$$

$$10 \overline{) 96} \cdot 5 = 3 \frac{1}{2}$$

20

1 | 25

12

3 | 00

8. What must I allow my Correspondent for disbursing on my Account 529*l.* 18*s.* 5*d.* at 2 $\frac{1}{4}$ per Cent.? Answer, 11*l.* 18*s.* 5*d.* $\frac{1}{2}$.

9. My Correspondent writes me Word, that he has bought Goods to the Amount of 754*l.* 16*s.* on my Account, what does his Commission come to at 2 $\frac{1}{2}$ per Cent.? Answer, 18*l.* 17*s.* 4*d.* $\frac{3}{4}$.

10. If I allow my Factor 3 $\frac{1}{2}$ per Cent. for Commission, what may I demand on the laying out of 876*l.* 5*s.* 10*d.*? Answer, 32*l.* 17*s.* 2*d.* $\frac{1}{2}$.

PURCHASING of STOCKS, &c.

RULE. Multiply the Sum to be purchased by the Excess, above 100, that Product divide by 100, the Produce of which added to the given Sum is the Purchase required.

It

If under *Pay*, multiply by the *Rate per Cent.* that *Pro-*
duct divided by 100, gives the *Purchase* thereof.

11. What is the Purchase
 of 575*l.* 10*s.* Bank Stock,
 at 131 $\frac{3}{4}$ per Cent.?

$$6 \times 5 + 1 = 31.$$

$$\begin{array}{r} 575.10 \\ 6 \end{array}$$

$$\begin{array}{r} 3453 \\ 5 \end{array}$$

$$17265. - - = 30$$

$$\begin{array}{r} \frac{3}{4} \frac{3}{4} \\ 575.10. - = 1 \\ 287.15. - = - \frac{1}{2} \\ 143.17.6 = - \frac{1}{4} \end{array}$$

$$182|72.2.6 = 31. \frac{3}{4}$$

$$20$$

$$\begin{array}{r} 14|42 \\ 12 \end{array}$$

$$5|10$$

$$575.10.0$$

$$115.14.5$$

$$758.4.5 \text{ Answer.}$$

12. What is the Purchase
 of 254*l.* 17*s.* Bank Annu-
 ities, at 97 $\frac{1}{4}$ per Cent.?

$$12 \times 8 + 1 = 97.$$

$$\begin{array}{r} 254.17 \\ 12 \end{array}$$

$$\begin{array}{r} 3058.4 \\ 8 \end{array}$$

$$24465.12. - = 96$$

$$\begin{array}{r} \frac{1}{4} \frac{1}{4} \\ 254.17. - = 1 \\ 63.14.3 = - \frac{1}{4} \end{array}$$

$$247|84.3.3 = 97 \frac{1}{4}$$

$$20$$

$$\begin{array}{r} 16|83 \\ 12 \end{array}$$

$$9|99$$

$$4$$

$$3|96$$

$$247.16.9. \frac{1}{4} \text{ Answer,}$$

13. At 110 $\frac{1}{4}$ per Cent. what is the Purchase of 2054*l.*
 16*s.* South Sea Stock? *Answer*, 2265*l.* 8*s.* 4*d.*

14. At 104*l.* $\frac{3}{8}$ per Cent. South Sea Annuities, what is
 the Purchase of 1797*l.* 14*s.*? *Answer*, 1876*l.* 6*s.* 11*d.* $\frac{1}{2}$.

15. What is the Purchase of 2750*l.* 17*s.* South Sea Old
 Annuities, at 102 $\frac{1}{2}$ per Cent.? *Answer*, 2823*l.* 1*s.* 2*d.* $\frac{1}{4}$.

16. At 96*l.* $\frac{3}{4}$ per Cent. what is the Purchase of 577*l.*
 19*s.* Bank Annuities? *Answer*, 559*l.* 3*s.* 3*d.* $\frac{3}{4}$.

17. At 124 $\frac{1}{4}$ per Cent. what is the Purchase of 758*l.*
 17*s.* 10*d.* India Stock? *Answer*, 945*l.* 15*s.* 4*d.* $\frac{1}{4}$.

R R O.

BROKAGE.

Is an Allowance to *Brokers* for helping *Merchants* or *Factors* to Persons to buy or sell them Goods.

RULE. Divide the given Sum by 100, and take Parts from the Quotient with the *Rate per Cent.*

18. If I employ a Broker to sell Goods for me to the Value of 2575 *l.* 17 *s.* 6 *d.* what is the Brokage at 4 *s.* per Cent.?

$$\begin{array}{r} 2575 \cdot 17 \cdot 6 \\ \underline{20} \\ 1517 \\ \underline{12} \\ 210 \end{array} \quad \begin{array}{r} 4 \text{ s. } \frac{2}{5} \quad 25 \cdot 15 \cdot 2 \\ \text{Answer, } \underline{5 \cdot 3 \cdot 0 \frac{1}{2}} \end{array}$$

19. What is the Brokage of 796 *l.* 14 *s.* 7 *d.* at 6 *s.* per Cent.? *Answer,* 21 *l.* 7 *s.* 9 *d.* $\frac{1}{2}$.

20. When a Broker sells Goods to the Amount of 7103 *l.* 3 *s.* 10 *d.* what may he demand for Brokage, if he is allow'd 5 *s.* 6 *d.* per Cent.? *Answer,* 19 *l.* 10 *s.* 9 *d.* $\frac{1}{4}$.

21. If a Broker is employ'd to buy a Quantity of Goods to the Value of 975 *l.* 6 *s.* 4 *d.* what is the Brokage at 6 *s.* 6 *d.* per Cent.? *Answer,* 3 *l.* 3 *s.* 4 *d.* $\frac{1}{2}$.

When the Time is for $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$ of a Year, besides a Number of Years given.

RULE. Take Parts of the *Interest* of one Year, which add to the *Interest* of the several Years given, and it will give the *Answer*.

22. What is the Interest of 554 *l.* 10 *s.* for 3 Months, at 4 per Cent. per Annum?

$$\begin{array}{r} 554 \cdot 10 \\ \underline{4} \\ 2218 \\ \underline{20} \\ 360 \\ \underline{12} \\ 720 \end{array}$$

m.
3 $\frac{1}{4}$ 22 . 3 . 7
Answer, 5 . 10 . 10 $\frac{1}{2}$

23. What is the Interest of 336 *l.* 15 *s.* 6 *d.* for 2 Years $\frac{1}{4}$, at 5 per Cent. per Annum?

$$\begin{array}{r} 336 \cdot 15 \cdot 6 \\ \underline{5} \\ 1683 \cdot 17 \cdot 6 \\ \underline{20} \\ 1677 \\ \underline{12} \\ 930 \\ \underline{4} \\ 120 \end{array} \quad \begin{array}{r} \frac{1}{2} \frac{1}{2} 16 \cdot 16 \cdot 9 \frac{1}{4} \\ \underline{2} \\ 33 \cdot 13 \cdot 6 \frac{1}{2} \\ \frac{1}{4} \frac{1}{2} 8 \cdot 8 \cdot 4 \frac{1}{2} \\ \underline{4 \cdot 4 \cdot 2 \frac{1}{4}} \\ 46 \cdot 9 \cdot 1 \frac{1}{4} \end{array}$$

23. What

24. What is the Interest of 325 l. 7 s. 6 d. at 6 per Cent. per Annum, for 3 Years and a Half? *Answer*, 68 l. 6 s. 6 d. $\frac{1}{4}$.

25. What is the Interest of 547 l. 2 s. 4 d. for 5 Years and a Half, at 4 per Cent. per Annum? *Answer*, 120 l. 7 s. 3 d. $\frac{1}{4}$.

26. What is the Interest of 257 l. 5 s. 1 d. at 4 per Cent. for 1 Year and three Quarters? *Answer*, 18 l. 0 s. 1 d. $\frac{1}{2}$.

27. What is the Interest of 479 l. 5 s. for 5 Years, one Quarter, at 5 per Cent. per Annum? *Answer*, 125 l. 16 s. 0 d. $\frac{1}{2}$.

When the Rate per Cent. is $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$ more than the Pounds given in the Rate, proceed as in Commission, and it will give the *Answer* for one Year, and for several proceed as in the last Rule.

28. What is the Interest of 175 l. 17 s. for 2 Years and 3 Quarters, at 4 $\frac{1}{2}$ per Cent.?

$$\begin{array}{r}
 175 \text{ l. } 17 \text{ s.} \\
 \times 4 \frac{1}{2} \\
 \hline
 703 \text{ s. } 8 \text{ d.} \\
 87 \text{ s. } 18 \text{ d. } 6 \\
 \hline
 791 \text{ s. } 6 \text{ d. } 6 \\
 \hline
 20 \\
 \hline
 18 | 26 \\
 \hline
 12 \\
 \hline
 3 | 18
 \end{array}
 \qquad
 \begin{array}{r}
 175 \text{ l. } 17 \text{ s.} \\
 \times 4 \frac{1}{2} \\
 \hline
 15 \text{ l. } 16 \text{ s. } 6 \\
 3 \text{ l. } 19 \text{ s. } 1 \frac{1}{2} \\
 1 \text{ l. } 19 \text{ s. } 6 \frac{1}{4} \\
 \hline
 21 \text{ l. } 15 \text{ s. } 2 \frac{1}{4} \text{ Answer.}
 \end{array}$$

29. What is the Interest of 397 l. 9 s. 5 d. for 2 Years and one Quarter, at 3 $\frac{1}{2}$ per Cent. per Annum? *Answer*, 31 l. 6 s.

30. What is the Interest of 576 l. 2 s. 7 d. for 7 Years one Quarter, at 4 $\frac{1}{2}$ per Cent. per Annum? *Answer*, 117 l. 19 s. 1 d. $\frac{1}{2}$.

31. What is the Interest of 279 l. 13 s. 8 d. at 5 $\frac{1}{4}$ per Cent. per Annum, for 3 Years and a Half? *Answer*, 51 l. 7 s. 10 d.

When the Interest is required for any Number of Weeks.

RULE. As 52 Weeks : are to the Interest of the given Sum for a Year :: so are the Weeks given : to the Interest required.

32. What

ASSISTANT.

Interest. 61

32. What is the Interest of 379 l. 13 s. 2 d. for 4 Weeks, at 4 per Cent. per Annum?

w.

w.

As 52 : 15 . 3 . 8 $\frac{1}{2}$:: 4 :

379 : 13 . 2

20

4

303

15 | 18 . 12 . 8

12

20

3644

3 | 72

4

12

14578

8 | 72

4

4

4)

2 | 88

52)58312(1121

52

— 12(280 $\frac{1}{4}$

63

52 2 | 3 . 4 . $\frac{1}{4}$

111

1 . 3 . 4 . $\frac{1}{4}$

104

72

52

—

20

Or thus : multiply by the Number of Weeks, and divide the Product by 4 and 13, being $4 \times 13 = 52$ 13)15 . 3 . 8 $\frac{1}{2}$

1 . 3 . 4 $\frac{1}{4}$

N.B. As it is 4 Weeks, I don't multiply, but only divide by 13.

33. What is the Interest of 259 l. 13 s. 5 d. for 20 Weeks, at 5 per Cent. per Annum? Answer, 4 l. 19 s. 10 d. $\frac{1}{4}$.

34. What is the Amount of 375 l. 6 s. 1 d. for 12 Weeks, at 4 $\frac{1}{2}$ per Cent. per Annum? Answer, 379 l. 4 s. 0 d. $\frac{1}{4}$.

35. What is the Amount of 256 l. 5 s. 3 d. for 25 Weeks, at 2 $\frac{1}{2}$ per Cent. per Annum? Answer, 259 l. 13 s.

When the Interest is for any Number of Days.

RULE. Multiply the Pence of the Principal by the Days and Rate per Cent, for a Dividend, cut off two Figures on the Right Hand, and divide by 365, the Quotient will be the Answer in Pence. Or,

As 365 Days : are to the Interest of the given Sum for a Year, :: so are the Days given : to the Interest required,

G

36.

62 Interest.

The TUTOR'S

36. What is the Interest of 240 l. for 120 Days at 4 per Cent. per Annum?

$$\begin{array}{r}
 240 \\
 240 \\
 \hline
 57600 \\
 120 \\
 \hline
 6912000 \\
 4 \\
 \hline
 12 \\
 365 \overline{) 276480 | 00} (757 \\
 \underline{2555} \\
 2098 \\
 \underline{1825} \\
 2730 \\
 \underline{2555} \\
 175 \\
 4 \\
 \hline
 700(1 \\
 \underline{365} \\
 335
 \end{array}$$

$$\begin{array}{r}
 \text{As } 365 : 9 \cdot 12 :: 120 : \\
 20 \\
 \hline
 192 \\
 120 \\
 \hline
 210 \\
 365 \overline{) 23040 | 6} (3 \\
 \underline{2190} \\
 1140 \\
 \underline{1095} \\
 45 \\
 12 \\
 \hline
 540(1 \\
 \underline{365} \\
 175 \\
 4 \\
 \hline
 700(1 \\
 \underline{365} \\
 335
 \end{array}$$

37. What is the Interest of 397 l. 5 s. 4 d. for 3 Years and 75 Days, at 5 l. per Cent. per Annum? *Ans.* 63 l. 13 s. 5 d.

38. At $5\frac{1}{2}$ per Cent. per Annum, what is the Interest of 985 l. 2 s. 7 d. for 5 Years 127 Days? *Ans.* 289 l. 15 s. 3 d.

39. What is the Interest of 2726 l. 1 s. 4 d. at $4\frac{1}{2}$ per Cent. per Annum for 3 Years 154 Days? *Ans.* 419 l. 15 s. 6 d. $\frac{1}{2}$.

When the Amount, Time and Rate per Cent. given, to find the Principal.

RULE. As the Amount of 100 l. at the Rate and Time given : is to 100 l. :: so is the Amount given : to the Principal required.

ASSISTANT.

Interest. 63

40. What Principal being put to Interest will amount to 402 l. 10 s. in 5 Years Time at 3 per Cent. per Annum?

$$3 \times 5 + 100 = 115 l. : 100 :: 402 . 10$$

$$\begin{array}{r} 20 \\ \hline 2300 \end{array} \quad \begin{array}{r} 20 \\ \hline 8050 \\ \hline 100 \end{array}$$

23|00)8050|00(350 l. Ans.

41. What Principal being put to Interest for 9 Years will amount to 734 l. 8 s. at 4 per Cent. per Annum? Answer, 540 l.

42. What Principal being put to Interest for 7 Years at 5 per Cent. per Annum, will amount to 334 l. 16 s? Answer, 248 l.

When the Principal, Rate per Cent. and Amount are given to find the Time.

RULE. As the Interest of the Principal for one Year : is to 1 Year :: so is the whole Interest to the Time required.

43. In what Time will 350 l. amount to 402 l. 10 s. at 3 per Cent. per Annum?

$$\begin{array}{r} 350 \\ 3 \\ \hline 10|50 \\ 20 \\ \hline 10|00 \end{array} \quad \begin{array}{r} \text{As } 10 . 10 : 1 :: 52 . 10 : 5 \\ 20 \\ \hline 210 \end{array} \quad \begin{array}{r} 20 \\ \hline 21|0)105|0(5 \text{ Answ.} \\ 105 \\ \hline \dots \end{array} \quad \begin{array}{r} 302 . 10 \\ 450 \\ \hline 52 . 10 \end{array}$$

44. In what Time will 540 l. amount to 734 l. 8 s. at 4 per Cent. per Annum? Answer, 9 Years.

45. In what Time will 248 l. amount to 334 l. 16 s. at 5 per Cent. per Annum? Answer, 7 Years.

When the Principal, Amount, and Time are given to find the Rate per Cent.

RULE. As the Principal : is to the Interest for the whole Time :: so is 100 l. : to the Interest for the same Time. Divide that Interest by the Time, and the Quotient will be the Rate per Cent.

46. At what *Rate per Cent.* will 350 *l.* amount to 402 *l.* 10s. in 5 Years Time? *Answer,* 5 per Cent.

As 350 : 52 . 10 :: 100 : 15 *l.*

20

52 . 10

1050

100

s. l.

35|0)10500|0(300=15÷5=3 per Cent.

47. At what *Rate per Cent.* will 248 *l.* amount to 334 *l.* 16s. in 7 Years Time? *Answer,* 5 per Cent.

48. At what *Rate per Cent.* will 540 *l.* amount to 734 *l.* 8s. in 9 Years Time? *Answer,* 4 per Cent.

Compound INTEREST

Is that which arises both from the *Principal* and *Interest*, that is, when the *Interest* on Money becomes due, and not paid, the same *Interest* is allowed on that *Interest* unpaid, as was on the *Principal* before.

RULE 1. Find the first Year's *Interest*, which add to the *Principal*, then find the *Interest* of that *Sum*, which add as before, and so on for any Number of Years.

2. Subtract the given *Sum* from the last *Amount*, and it will give the *Compound Interest* required.

EXAMPLES.

1. What is the *Compound Interest* of 500 *l.* forborne 3 Years at 5 per Cent. per Annum?

500	500	525	551 . 5
5	25	26 . 5	27 . 11 . 3
25 00	525 1st Year.	551 . 5 2d. Year.	578 . 16 . 3 3d Year.
5		5	500 Prin. sub.
26 25		27 56 . 5	78 . 16 . 3 = Inter. for
20		20	3 Years.
5 00		11 25	
		12	
		3 00	

2. What is the *Amount* of 400 *l.* forborne 3 Years and $\frac{1}{2}$, at 6 per Cent. per Annum. *Compound Interest?* *Answer,* 490 *l.* 13 s. 11 d. $\frac{1}{4}$.

3. What

ASSISTANT.

Rebate or Discount. 65

3. What will 650 *l.* amount to in 9 Years at 5 per Cent. per Annum Compound Interest? Answer, 829 *l.* 11 *s.* 8 *d.*

4. What is the Amount of 550 *l.* 10 *s.* for 3 Years and 6 Months, at 6 per Cent. per Annum Compound Interest? Answer, 675 *l.* 6 *s.* 5 *d.*

5. What is the Compound Interest of 764 *l.* for 4 Years and 9 Months, at 6 *l.* per Cent. per Annum? Answer, 243 *l.* 18 *s.* 8 *d.* $\frac{1}{2}$.

6. What is the Compound Interest of 57 *l.* 10 *s.* 6 *d.* for 5 Years 7 Months 15 Days, at 5 per Cent. per Annum? Answer, 18 *l.* 3 *s.* 8 *d.* $\frac{1}{2}$.

7. What is the Compound Interest of 259 *l.* 10 *s.* for 3 Years 9 Months and 10 Days, at 4 $\frac{1}{2}$ per Cent per Annum? Answer, 46 *l.* 19 *s.* 10 *d.* $\frac{1}{2}$.

REBATE OR DISCOUNT

IS the abating of so much Money on a Debt, to be received before it is due, as that Money, if put to Interest, would gain in the same Time, and at the same Rate. As 100 *l.* present Money would discharge a Debt of 105 *l.* to be paid a Year to come, Rebate being made at 5 per Cent.

RULE. As 100 *l.* with the Interest for the Time given: is to that Interest :: so is the Sum given: to the Rebate required. Subtract the Rebate from the given Sum, and the Remainder will be the present Worth.

EXAMPLES.

1. What is the Discount and present Worth of 487 *l.* 12 *s.* for 6 Months at 6 per Cent. per Annum?

6 m. $\frac{1}{2}$	6	As 103	:	3	::	487 . 12
	—	20		—		20
	3	2060		—		9752
	100			—		3
	—			—		1. s.
	103			206 0	2925 6	(14 4 Rebate.
				206		
	487 . 12			865		
	14 . 4			824		
	—			—		

Ans. 473 . 8 . 0 present Worth.

416 = 4 *s.*

G 3

2. What

2. What is the present Payment of 357 *l.* 10 *s.* which was agreed to be paid 9 Months hence, at 5 per Cent. per Annum? *Answer*, 344 *l.* 11 *s.* 7 *d.*

3. What is the Discount of 275 *l.* 10 *s.* for 7 Months, at 5 per Cent. per Annum? *Answer*, 7 *l.* 16 *s.* 1 *d.* $\frac{3}{4}$.

4. Bought Goods to the Value of 109 *l.* 10 *s.* to be paid at 9 Months, what present Money will discharge the same, if I am allowed 6 per Cent. per Annum Discount. *Answer*, 104 *l.* 15 *s.* 8 *d.* $\frac{1}{2}$.

5. What is the present Worth of 527 *l.* 9 *s.* 1 *d.* payable 7 Months hence, at 4 $\frac{1}{2}$ per Cent.? *Ans.* 514 *l.* 13 *s.* 10 *d.* $\frac{3}{4}$.

6. What is the Discount of 85 *l.* 10 *s.* due September the 8th, this being July 4th, Rebate, at 5 per Cent. per Ann.? *Answer*, 15 *s.* 3 *d.* $\frac{1}{2}$.

7. Sold Goods for 875 *l.* 5 *s.* 6 *d.* to be paid 5 Months hence, what is the present Worth at 4 $\frac{1}{2}$ per Cent.? *Ans.* 859 *l.* 3 *s.* 4 *d.*

8. What is the present Worth of 500 *l.* payable in 10 Months, at 5 per Cent. per Annum? *Answer*, 480 *l.*

9. How much ready Money can I receive for a Note of 75 *l.* due 15 Months hence, at 5 per Cent.? *Answer*, 70 *l.* 11 *s.* 9 *d.* $\frac{1}{4}$.

10. What will be the present Worth of 150 *l.* payable at 3 four Months, i. e. one third at 4 Months, one third at eight Months, and one third at 12 Months, at 5 per Cent. Discount? *Answer*, 145 *l.* 3 *s.* 9 *d.* $\frac{1}{2}$.

11. Sold Goods to the Value of 575 *l.* 10 *s.* to be paid at two 3 Months, what must be discounted for present Payment, at 5 per Cent.? *Ans.* 10 *l.* 11 *s.* 4 *d.* $\frac{1}{2}$.

12. What is the present Worth of 500 *l.* at 4 per Cent. 100 *l.* being to be paid down, and the rest at two 6 Months *Answer*, 488 *l.* 7 *s.* 9 *d.*

EQUATION OF PAYMENTS

IS when several Sums are due at different Times. To find a mean Time for paying the whole Debt, to which this is the common.

RULE. Multiply each Term by its Time, and divide the Sum of the Products by the whole Debt, the Quotient is accounted the mean Time.

EXAMPLES.

1. *A* owes *B* 200 *l.* whereof 40 *l.* is to be paid at 3 Months, 60 *l.* at 5 Months, and 100 *l.* at 10 Months, at what Time may the whole Debt be paid together, without Prejudice to either?

$$\begin{array}{rcl}
 l. & m. & \\
 40 \times 3 & = & 120 \\
 60 \times 5 & = & 300 \\
 100 \times 10 & = & 1000 \\
 \hline
 2 | 00 & 14 & 20 \\
 & 7 \text{ Months } \frac{1}{10} &
 \end{array}$$

2. *B* owes *C* 800 *l.* whereof 200 *l.* is to be paid at 3 Months, 100 *l.* at 4 Months, 300 at 5 Months, and 200 *l.* at 6 Months; but they agreeing to make but one Payment of the Whole, I demand when that Time must be? *Answer*, 4 Months 18 Days.

3. I bought of *K* a Quantity of Goods to the Value of 360 *l.* which was to have been paid as follows: 120 *l.* at 2 Months, 200 at 4 Months, and the rest at 5 Months; but they afterwards agreed to have it paid at one mean Time, that Time is demanded? *Answer*, 3 Months 13 Days.

4. A Merchant bought Goods to the Value of 500 *l.* to pay 100 *l.* at the End of 3 Months, 150 *l.* at the End of 6 Months, and 250 *l.* at the End of 12 Months; but afterwards they agreed to discharge the Debt at one Payment; at what Time was this Payment made? *Answer*, 8 Months, 12 Days.

5. *H* is indebted to *L* a certain Sum, which is to be paid at 6 different Payments, that is, 1 4th at 2 Months, 1 8th at 3 Months, 1 8th at 4 Months, 1 4th at 5 Months, 1 8th at 6 Months, and the rest at 7 Months; but they agree that the Whole should be paid at one equated Time, what is that Time? *Answer* 4 Months one Quarter.

6. *A* is indebted to *B* 120 *l.* whereof $\frac{1}{2}$ is to be paid at 3 Months, $\frac{1}{4}$ at 6 Months, and the rest at 9 Months, what is the equated Time of the whole Payment? *Answer*, 5 Months, 7 Days.

B A R T E R

IS the exchanging one Commodity for another, and informs the *Traders*, so to proportion their Goods, that neither may sustain *Loss*.

RULE. First find the Value of that Commodity, whose Quantity is given, then find what Quantity of the other, at the Rate proposed, you may have for the same Money.

2dly. When one has Goods at a certain Price ready Money, but in *Bartering* advances it to something more; find what the other ought to rate his Goods at, in Proportion to that Advance, and then proceed as before.

EXAMPLES.

1. What Quantity of Chocolate, at 4 s. per lb. must be delivered in Barter for 2 cwt. of Tea, at 9 s. per lb.

3 Cwt.

112

224

9

4)2016 the Value of the Tea.

504 lb. of Chocolate.

2. A and B barter: A hath 20 cwt. of Prunes, at 4 d. per lb. ready Money, but in Barter will have 5 d. per lb. and B hath Hops worth 32 s. per cwt. ready Money, what ought B to rate his Hops at in Barter, and what Quantity must be given for the 20 cwt. of Prunes?

112 As 4 : 5 :: 32

20

5

s.

40

2240

4)160

12

5

48|0)1120|0(23. 1. 9 $\frac{16}{48}$ Ans.

96

160

144

16 = 1 qr. 9 lb. $\frac{16}{48}$.

40 s. in Barter.

3. How

3. How much Tea at 9s. per lb. can I have in Barter for 4 cwt. 2 qrs. of Chocolate, at 4s. per lb. *Answer*, 2 cwt.

4. Two Merchants barter; *A* hath 20 cwt. of Cheese, at 21s. 6d. per cwt. *B* hath 8 Pieces of Irish Cloth, at 3l. 14s. per Piece, I desire to know who must receive the Difference, and how much? *Answer*, *B* must receive of *A* 8l. 2s.

5. *A* and *B* barter: *A* hath $3\frac{1}{2}$ lb. of Pepper, at 13d. $\frac{1}{2}$ per lb. *B* hath Ginger, at 15d. $\frac{1}{4}$ per lb. how much Ginger must be delivered in Barter for the Pepper? *Answer*, 3 lb. 1 oz. $\frac{3}{8}$.

6. How many Dozen of Candles, at 5s. 2d. per Dozen, must be delivered in Barter for 3 cwt. 2 qrs. 16 lb. of Tallow, at 37s. 4d. per cwt? *Answer*, 26 doz. 3 lb.

7. *A* hath 608 Yards of Cloth worth 14s. per yd. for which *B* giveth him 125l. 12s. in ready Money, and 85 cwt. 2 qrs. 24 lb. Bees-Wax, the Question is, what did *B* reckon his Bees-Wax at per cwt? *Answer*, 3l. 10s.

8. *A* and *B* barter: *A* hath 320 doz. of Candles, at 4s. 6d. per doz. for which *B* giveth him 30l. in Money, and the rest in Cotton, at 8d. per lb. I desire to know how much Cotton *B* gave *A* besides the Money? *Answer*, 11 cwt. 1 qr.

9. If *B* hath Cotton at 1s. 2d. per lb. how much must he give *A* for 114 lb. of Tobacco, at 6d. per lb.? *Answer*, 48 lb. $\frac{1}{4}$.

10. *C* hath Nutmegs worth 7s. 6d. per lb. ready Money, but in barter will have 8s. per lb. and *D* hath Leaf Tobacco worth 9d. per lb. ready Money, how much must *D* rate his Tobacco at per lb. that his Profit may be equivalent with *C*'s? *Answer*, 9d. $\frac{1}{2}$ $\frac{3}{8}$.

PROFIT AND LOSS

IS a Rule that discovers what is *got* or *lost* in the buying or selling of Goods, and instructs us to raise or fall the Price, so as to gain or lose so much per Cent. or otherwise.

EXAM

EXAMPLES.

1. If a Yard of Cloth is bought for 11 s. and sold for 12 s. 6 d. what is the Gain per Cent.?

$$\begin{array}{r} \text{As } 11 : 1.6 :: 100 \\ 12.6 \quad \text{---} \quad \text{---} \\ 11. \quad \text{---} \quad 18 \quad 2000 \\ \text{---} \quad \text{---} \quad \text{---} \\ 1.6 \quad \text{---} \quad 18 \\ 11)36000 \\ \text{---} \\ 12)3272 \\ \text{---} \\ 2)0)27|2.8 \\ \text{---} \\ \text{Answer, } 13.12.8 \frac{8}{11} \end{array}$$

2. If 60 Ells of Holland cost 18 l. what must 1 Ell be sold for to gain 8 l. per Cent.?

$$\begin{array}{r} \text{As } 100 : 18 :: 108 \\ 108 \quad 12 \times 5 = 6 \\ \text{---} \\ 1|00)19|44 \quad 12)19.8.9\frac{5}{2} \\ 20 \quad \text{---} \\ \text{---} \quad 5)1.12.4\frac{3}{4} \\ 8)80 \quad \text{---} \\ 12 \quad \text{---} \quad - . 6.5\frac{1}{4} \\ \text{---} \\ 9)60 \\ 4 \\ \text{---} \\ 2)40 \quad \text{Answer, } 6s \ 5d. \frac{3}{4} \end{array}$$

3. If 1 lb. of Tobacco cost 16 d. and is sold for 20 d. what is the Gain per Cent. ? Answer, 25 l.

4. If a Parcel of Cloth be sold for 560 l. and at 12 per Cent. Gain, what was the prime Cost ? Answer, 500 l.

5. If a Yard of Cloth is bought for 13 s. 4 d. and sold again for 16 s. what is the Gain per Cent. ? Answer, 20 l.

6. If 112 lb. of Iron cost 27 s. 6 d. what must 1 cwt. be sold for, to gain 15 per Cent. ? Answer, 1 l. 11 s. 7 d. $\frac{3}{4}$.

7. If 375 Yards of Broad Cloth be sold for 490 l. and 20 per Cent. Profit, what did it cost per Yard ? Ans. 1 l. 1 s. 9 d. $\frac{1}{4}$.

8. Sold 1 cwt. of Hops for 6 l. 15 s. at the Rate of 25 l. per Cent. Profit, what would have been the Gain per Cent. if I had sold them for 8 l. per cwt. ? Answer, 29 l. 12 s. 7 d.

9. If 90 Ells of Cambric cost 60 l. how must I sell it per Yard to gain 18 l. per Cent. ? Answer, 12 s. 7 d.

10. A Plumber sold 10 Fother of Lead for 204 l. 15 s. (the Fother being 19 cwt. $\frac{1}{2}$) and gain'd after the Rate of 12 l. 10 s. per Cent. what did it cost him per cwt. ? Ans. 18 s. 8 d.

11. Bought 436 Yards of Cloth, at the Rate of 8 s. 6 d. per Yard, and sold it for 10 s. 4 d. per Yard, what was the Gain of the Whole ? Answer, 39 l. 19 s. 4 d.

12. Paid 69 l. for one Ton of Steel, which is retailed at 6 d. per lb. what is the Profit or Loss by the Sale of 14 Ton ? Answer, 182 l. Loss.

13. Bought

13. Bought 124 Yards of Linen for 32 *l.* how should the same be retailed *per* Yard to gain 15 *l.* *per* Cent. ? *Answer*, 11 *d.* $\frac{28}{114}$.

14. Bought 249 Yards of Cloth at 3 *s.* 4*d.* *per* Yard, re-tailed the same at 4 *s.* 2*d.* *per* Yard, what is the Profit in the Whole, and how much *per* Cent ? *Answer*, 10 *l.* 7 *s.* 6*d.* Profit, and 25 *l.* *per* Cent.

F E L L O W S H I P

IS when two or more join their *Stocks* and Trade together, so to determine each Person's particular *Share* of the *Gain* or *Loss*, in Proportion to his *Principal* in the joint *Stock*.

By this Rule a Bankrupt's Estate may be divided amongst his Creditors, as also Legacies may be adjusted when there is a Deficiency of Assets or Effects.

FELLOWSHIP is either with or without TIME:

FELLOWSHIP without TIME.

RULE. As the whole *Stock* : is to the whole *Gain* and *Loss* : : so is each *Man's Share* in *Stock* : to his *Share* of the *Gain* or *Loss*.

PROOF. Add all the *Shares* together, and the *Sum* will be equal to the given *Gain* or *Loss* ; — but the surest Way is, As the whole *Gain* or *Loss* : is to the whole *Stock* : : so is each *Man's Share* of the *Gain* or *Loss* : to his *Share* in *Stock*.

E X A M P L E S.

1. Two Merchants trade together ; *A* put into *Stock* 20 *l.* and *B.* 40 *l.* they gained 50 *l.* what is each Person's *Share* thereof ?

$$20 + 40 = 60$$

As 60 : 50 : : 20 As 60 : 50 : : 40 35 . 6 . 8 *B's Share*,
 20 40 16 . 13 . 4 *A's*

6 | 0 | 100 | 0 |

60 | 2000

50

16 *l.* 13 *s.* 4 *d.*

33 *l.* 6 *s.* 8 *d.*

2. Three

2. Three Merchants trade together, *A*, *B*, and *C*; *A* put in 20 *l*. *B* 30 *l*. and *C* 40 *l*. they gained 180 *l*. what is each Man's Part of the Gain? *Answer*, *A* 40 *l*. *B* 60 *l*. *C* 80 *l*.

3. *A*, *B*, and *C* enter into Partnership; *A* puts in 364 *l*. *B* 482 *l*. and *C* 500 *l*. and they gained 867 *l*. what is each Man's Share in Proportion to his Stock? *Answer*, *A* 234 *l*. 9 *s*. 3 *d*. $\frac{1}{2}$. rem. 70. *B* 310 *l*. 9 *s*. 5 *d*. — rem. 248. *C* 322 *l*. 1 *s*. 3 *d*. $\frac{1}{2}$. rem. 1028.

4. Four Merchants. *A*, *B*, *C* and *D* make a Stock; *A* puts in 227 *l*. *B* 349 *l*. *C* 115 *l*. and *D* 439 *l*. in trading they gained 428 *l*. I demand each Merchant's Share of the Gain? *Answer*, *A* 85 *l*. 19 *s*. 6 *d*. $\frac{1}{4}$ 690. *B* 132 *l*. 3 *s*. 9 *d*. — 120. *C* 43 *l*. 11 *s*. 1 *d*. $\frac{1}{2}$. 250. *D* 166 *l*. 5 *s*. 6 *d*. $\frac{1}{4}$. 70.

5. Three Persons, *D*, *E* and *F* join in Company; *D*'s Stock was 750 *l*. *E*'s 460 *l*. and *F*'s 500 *l*. and at the End of 12 Months they gained 684 *l*. what is each Man's particular Share of the Gain? *Ans*. *D* 300 *l*. *E* 184, and *F* 200.

6. A Merchant is indebted to *A* 275 *l*. 14 *s*. to *B* 304 *l*. 7 *s*. to *C* 152 *l*. and to *D* 104 *l*. 6 *s*. but upon his Decease, his Estate is found to be worth but 675 *l*. 15 *s*. how must it be divided amongst his Creditors? *Answer*, *A* 222 *l*. 15 *s*. 2 *d*. — 6584. *B*'s 245 *l*. 18 *s*. 1 *d*. $\frac{1}{2}$. 15750. *C*'s 122 *l*. 16 *s*. 2 *d*. $\frac{1}{2}$. 12227. and *D*'s 84 *l*. 5 *s*. 5 *d*. — 15620.

7. Four Persons trading together in a Joint Stock, of which *A* has $\frac{1}{3}$. *B* $\frac{1}{4}$. *C* $\frac{1}{5}$. and *D* $\frac{1}{6}$, and at the End of Six Months, they gain 100 *l*. what is each Person's Share of the said Gain? *Answer*, *A* 35 *l*. 1 *s*. 9 *d*. — 48. *B* 26 *l*. 6 *s*. 3 *d*. — 36. *C* 21 *l*. 1 *s*. 0 *d*. $\frac{1}{2}$. 120, and *D* 17 *l*. 10 *s*. 10 *d*. $\frac{1}{2}$ 24.

8. Two Persons purchased an Estate of 1700 *l*. per Ann. Freehold for 27200 *l*. when Money was at 6 per Cent. Interest, and 4 *s*. per *l*. Land-Tax, whereof *A* paid 15000 *l*. and *B* the rest; some Time after the Interest of Money falling to 5 per Cent. and 2 *s*. per *l*. Land-Tax, they sell the said Estate for 24 Years Purchase, I desire to know each Person's Share? *Answer*, *A* 22500 *l*. *B* 18300 *l*.

9. *A*, *B* and *C*, join Stocks in Trade; the Amount of their Stocks is 647 *l*. and are in Proportion as 4, 6 and 8 is to one another, and the Amount of their Gain is equal to *A*'s Stock, what is each Man's Stock and Gain? *Answer*, *A*'s Stock, 143 *l*. 15 *s*. 6 *d*. $\frac{1}{2}$. $\frac{2}{3}$. Gain, 31 *l*. 19 *s*. 0 *d*. $\frac{361}{171}$. *B*'s — 215 *l*. 13 *s*. 4 *d*. 47 *l*. 18 *s*. 6 *d*. $\frac{1}{2}$. $\frac{172}{171}$. *C*'s — 287 *l*. 11 *s*. 1 *d*. $\frac{1}{2}$. $\frac{1}{3}$. 63 *l*. 18 *s*. 0 *d*. $\frac{172}{171}$.

10. A, B and C join Stocks in Trade, the Amount of their Stocks was 100*l*. A's Gain 3*l*. B's 5*l*. and C's 8*l*. what was each Man's Stock? *Answer*, A's 18*l*. 15*s*. B's 31*l*. 5*s*. and C's 50*l*.

FELLOWSHIP with TIME:

RULE. As the Sum of the Products of each Man's Money and Time : is to the whole Gain or Loss :: so is each Man's Product : to his Share of the Gain or Loss.

PROOF. As in Fellowship without Time.

EXAMPLES.

1. A and B enter Partnership; A put in 40*l*. for three Months, and B 75*l*. for 4 Months; and they gained 70*l*. what is each Man's Share of the Gain? *Ans*. A 20*l*. B 50*l*.

$$40 \times 3 = 120$$

$$75 \times 4 = 300$$

$$\underline{420}$$

$$\text{As } 420 : 70 :: 120$$

$$\underline{120}$$

$$42 \mid 0 \ 840 \mid 0$$

$$\text{As } 420 : 70 :: 300$$

$$\underline{300}$$

$$42 \mid 0 \ 2100 \mid 0$$

$$\underline{20}$$

$$\underline{50}$$

2. Three Merchants join in Company, A puts in 105*l*. 14*s*. for 3 Months, B 169*l*. 18*s*. 3*d*. for 5 Months, and C 59*l*. 14*s*. 10*d*. for 11 Months, and they gained 364*l*. 18*s*. what is each Man's Part of the Gain? *Answer*. A's 102*l*. 6*s*. 4*d*.—5008. B's 148*l*. 1*s*. 1*d*.—482802. and C's 114*l*. 10*s*. 6*d*.—14707.

3. Three Merchants join in Company for 18 Months, A puts in 500*l*. and at 5 Months End took out 200*l*. at 10 Months End puts in 300*l*. and at the End of 18 Months takes out 130*l*. B puts in 400*l*. and at the End of 3 Months 270*l*. more, at 9 Months he takes out 140*l*. but puts in 100*l*. at the End of 12 Months, and withdraws 99*l*. at the End of 15 Months; C puts in 900*l*. and at 6 Months took out 200*l*. at the End of 11 Months puts in 500*l*. but takes out that and 100 more at the End of 13 Months; they gain 400*l*. I desire to know each Man's Share of the Gain? *Answer*, A 50*l*. 7*s*. 6*d*.—21720. B 62*l*. 13*s*. 5*d*.—29859, and C 27*l*. 0*s*. 0*d*.—14167.

4. *A B and C hold a Piece of Ground in common, for which they are to pay 36 l. 10 s. 6 d. A puts in 23 Oxen 27 Days, B 21 Oxen 35 Days, and C 16 Oxen 23 Days, what is each Man to pay of the said Rent? Answer, A 13 l. 3 s. 1 d. $\frac{2}{3}$. 624. B 15 l. 11 s. 5 d. — 1688, and C 7 l. 15 s. 11 d. — 1136.*

A L L I G A T I O N.

ALLIGATION is either MEDIAL or ALTERNATE.

A L L I G A T I O N M E D I A L

IS when the *Prices and Quantities* of several *Simples* are given to be mixed, to find the *mean Price* of that Mixture.

RULE. As the whole *Composition* : is to its total *Value* :: so is any Part of the *Composition* : to its *mean Price*.

PROOF. Find the *Value* of the whole Mixture at the *mean Rate*, and if it agrees with the total *Value* of the several *Quantities* at their respective *Prices*, the Work is right.

E X A M P L E S.

1. A Farmer mixed 20 Bushels of Wheat, at 5 s. per Bushel, and 36 Bushels of Rye, at 3 s. per Bushel, with 40 Bushels of Barley, at 2 s. per Bushel. I desire to know the Worth of a Bushel of this Mixture?

$$20 \times 5 = 100$$

$$36 \times 3 = 108$$

$$40 \times 2 = 80$$

$$\hline 96$$

$$288$$

$$\text{As } 96 :: 288 : 1 :: 3$$

Answer, 3 s.

2. A Vintner mingles 15 Gallons of Canary, at 8 s. per Gallon, with 20 Gallons, at 7 s. 4 d. per Gallon, 10 Gallons of Sherry, at 6 s. 8 d. per Gallon, and 24 Gallons of White Wine, at 4 s. per Gallon, what is the Worth of a Gallon of this Mixture? *Answer, 6 s. 2 d. $\frac{1}{2}$. $\frac{4}{9}$.*

3. A Grocer mingled 4 cwt. of Sugar, at 56 s. per cwt. 7 cwt. at 43 s. per cwt. and 5 cwt. at 37 s. per cwt. I demand the Price of 2 cwt. of this Mixture? *Answer, 4 l. 8 s. 9 d.*

4. A

4. A Malster mingles 30 Quarters of brown Malt, at 28 s. per Quarter, with 46 Quarters of pale, at 30 s. a Quarter, and 24 Quarters of high dried ditto, at 25 s. a Quarter, what is the Value of 8 Bushels of this Mixture? *Answer*, 1 l. 8 s. 2 d. $\frac{1}{4}$.

5. If I mix 27 Bushels of Wheat, at 5 s. 6 d. the Bushel, with the same Quantity of Rye, at 4 s. per Bushel, and 14 Bushels of Barley, at 2 s. 8 d. per Bushel, what is the Worth of a Bushel of this Mixture? *Answer*, 4 s. 3 d. $\frac{3}{8}$.

6. A Grocer mingled 3 cwt. of Sugar, at 56 s. per cwt. 6 cwt. at 1 l. 17 s. 4 d. per cwt. and 3 cwt. at 3 l. 14 s. 8 d. per cwt. what is 1 cwt. of this Mixture worth? *Answer*, 2 l. 11 s. 4 d.

7. A Mealman has Flour of several Sorts, and would mix 3 Bushels at 3 s. 5 d. per Bushel, 4 Bushels at 5 s. 6 d. per Bushel, and 5 Bushels at 4 s. 8 d. per Bushel, what is the Worth of a Bushel of this Mixture? *Answer*, 4 s. 7 d. $\frac{1}{12}$.

8. A Vintner mixes 20 Gallons of Port, at 5 s. 4 d. per Gallon, with 12 Gallons of White Wine, at 5 s. per Gallon, 30 Gallons of Lisbon, at 6 s. per Gallon, and 20 Gallons of Mountain, at 4 s. 6 d. per Gallon, what is a Gallon of this Mixture worth? *Answer*, 5 s. 3 d. $\frac{1}{4}$.

9. A Farmer mingled 20 Bushels of Wheat, at 5 s. per Bushel, and 36 Bushels of Rye, at 3 s. per Bushel, with 40 Bushels of Barley, at 2 s. per Bushel, I desire to know the Worth of a Bushel of this Mixture? *Answer*, 3 s.

10. A Person mixing a Quantity of Oats, at 2 s. 6 d. per Bushel, with the like Quantity of Beans, at 4 s. 6 d. per Bushel, would be glad to know the Price of one Bushel of that Mixture? *Answer*, 3 s. 6 d.

11. A Refiner having 12 lb. of Silver Bullion, of 6 oz. fine, would melt it with 8 lb. of 7 oz. fine, and 10 lb. of 8 oz. fine, required the fineness of 1 lb. of that Mixture. *Answer*, 6 oz. 18 dwt. 16 gr.

12. If with 40 Bushels of Corn, at 4 s. per Bushel, there are mixed 10 Bushels, at 6 s. per Bushel, 30 Bushels, at 5 s. per Bushel, and 20 Bushels, at 3 s. per Bushel, what will 10 Bushels of that Mixture be worth? *Answer*, 2 l. 3 s.

13. A Tobacconist would mix 50 lb. of Tobacco, at 11 d. per lb. with 30 lb. at 14 d. per lb. 25 lb. at 22 d. per lb. and 37 lb. at 2 s. per lb. what will 1 lb. of this Mixture be worth? *Answer*, 16 d. $\frac{1}{4}$.

ALLIGATION ALTERNATE

IS when the *Prices* of several Things are given, to find such *Quantities* of them to make a Mixture, that may bear a *Price* propounded.

In ordering the Rates and given Prices, observe,

1. Place them one under the other, and the propounded *Price* or *mean Rate*, on the left Hand of them, thus

18	3
22	6
24	4
28	2

2. Link the several *Rates* together by 2 and 2, always observing to join a *greater* and a *less* than the *mean*.

3. Against each *Extream* place the *Difference* of the *Mean* and its *Tote-Fellow*.

When the *Prices* of the several *Simples* and the *mean Rate* are given, without any *Quantity*, to find how much of each *Simple* is required to compose the Mixture.

RULE. Take the *Differences* between each *Price* and the *mean Rate*, and set them *alternately*, they will be the *Answers* required.

PROOF. By *Alligation Medial*.

EXAMPLES.

1. A Vintner would mix four Sorts of Wines together, of 18 d. 20 d. 24 d. and 28 d. per Quart, what Quantity of each must he take to sell the Mixture at 22 d. per Quart?

<i>Answer.</i>		<i>Proof.</i>	<i>Or thus.</i>	
18	2 of 18 d. = 36d.	18	6 of 18 d. = 108 d.	
22	6 of 20 d. = 120	22	2 of 20 d. = 40	
24	4 of 24 d. = 96	24	2 of 24 d. = 48	
28	2 of 28 d. = 56	28	4 of 28 d. = 112	
	14		24	
	308		308	
	22 d.		22 d.	

Note. Questions in this Rule do admit of a great Variety of Answers, according to the Manner of linking them.

2. A Grocer would mix Sugars at 4 d. 6 d. and 10 d. per lb. so as to sell the Compound at 8 d. per lb. what Quantity of each must he take? *Answer*, 2 lb. at 4 d. 2 lb. at 6 d. and 6 lb. at 10 d.

3. I desire to know how much Tea, at 16 s. 14 s. 9 s. and 8 s. per lb. will compose a Mixture worth 10 s. per lb? *Answer*, 1 lb. at 16 s. 2 lb. at 14 s. 6 lb. at 9 s. and 4 lb. at 8 s.

4. A Farmer would mix as much Barley at 3 s. 6 d. per Bushel, Rye at 4 s. per Bushel, and Oats at 2 s. per Bushel, as to make a Mixture worth 2 s. 6 d. per Bushel; how much is that of each Sort? *Answer*, 6 of Barley, 6 of Rye, and 30 of Oats.

5. A Grocer would mix Raisins of the Sun at 7 d. per lb. with Malaga at 6 d. and Smyrna's at 4 d. per lb. I desire to know what Quantity of each Sort he must take to sell them at 5 d. per lb.? *Answer*, 1 lb. of Raisins of the Sun, 1 lb. of Malaga, and 3 lb. of Smyrna's.

6. A Tobacconist would mix Tobacco of 2 s. 1 s. 6 d. and 1 s. 3 d. per lb. so as the Compound may bear a Price of 1 s. 8 d. per lb. what Quantity of each Sort must he take? *Answer*, 7 lb. at 2 s. 4 lb. at 1 s. 6 d. and 4 lb. at 1 s. 3 d.

ALTERNATION PARTIAL

IS when the Prices of all the *Simples*, the *Quantity* of but one of them, and the *mean Rate* are given, to find the several *Quantities* of the rest in Proportion to that given.

RULE 1. Take the *Difference* between each *Price*, and the *mean Rate* as before. *Then*

As the *Difference* of that *Simple*, whose *Quantity* is given :: is to the rest of the *Differences* severally :: so is the *Quantity* given : to the several *Quantities* required.

EXAMPLES.

1. A Tobacconist being determined to mix 20 lb. of Tobacco, at 15 d. per lb. with others at 16 d. per lb. 18 d. per lb. and 22 d. per lb. how many Pounds of each Sort must he take to make one Pound of that Mixture worth 17 d.

	<i>Ans.</i>	<i>Proof.</i>	
15	5	20 lb. at 15 d. = 300 d.	As 5 : 1 :: 20 : 4
16	1	4 lb. at 16 d. = 64	As 5 : 1 :: 20 : 4
18	1	4 lb. at 18 d. = 72	As 5 : 2 :: 20 : 8
22	2	8 lb. at 22 d. = 176	

As 36 lb. : 612 d. : : 1 lb. : 17 d.

H 3

2. A.

2. A Farmer would mix 20 Bushels of Wheat, at 60 d. the Bushel, with Rye, at 36 d. Barley, at 24 d. and Oats at 18 d. per Bushel; how much must he take of each Sort to make the Composition worth 32 d. per Bushel? *Answer, 20 Bushels of Wheat, 35 Bushels of Rye, 70 Bushels of Barley, and 10 Bushels of Oats.*

3. A Person is desirous of mixing Wheat, at 4 s. per Bushel, Rye, at 3 s. per Bushel, Barley, at 2 s. per Bushel, with 12 Bushels of Oats, at 18 d. per Bushel, would be glad to know how many Bushels of each Sort he must take to make the Composition worth 3 s. 6 d. per Bushel. *Ans. 96 Bushels of Wheat, 12 Bushels of Rye, 12 of Barley, and 12 of Oats.*

4. A Distiller would mix 40 Gallons of French Brandy, at 12 s. per Gallon, with English, at 7 s. and Spirits, at 4 s. per Gallon, what Quantity of each Sort must he take to afford it for 8 s. per Gallon? *Answer, 40 Gallons French, 32 English, and 32 Spirits.*

5. A Grocer would mix Teas of 12 s. 10 s. and 6 s. with 20 lb. at 4 s. per lb. how much of each Sort must he take to make the Composition worth 8 s. per lb.? *Answer, 20 lb. at 4 s. 10 lb. at 6 s. 10 lb. at 10 s. 20 lb. at 12 s.*

6. A Wine Merchant is desirous of mixing 18 Gallons of Canary, at 6 s. 9 d. per Gallon, with Malaga's, at 7 s. 6 d. per Gallon, Sherry, at 5 s. per Gallon, and White Wine, at 4 s. 3 d. per Gallon, how much of each Sort must he take, that the Mixture may be sold for 6 s. the Gallon? *Answer, 18 Gallons of Canary, 31 $\frac{1}{2}$ of Malaga, 13 $\frac{1}{2}$ of Sherry, and 27 of White Wine.*

ALTERNATION TOTAL

IS when the Price of each Simple, the Quantity to be compounded, and the mean Rate are given, to find how much of each Sort will make that Quantity.

RULE 1. Take the Difference between each Price and the mean Rate as before, then

As the Sum of the Differences : is to each particular Difference : : so is the Quantity given : to the Quantity required.

EXAM.

1. A Grocer has four Sorts of Sugar, viz. of 12 d. 10 d. 8 d. and 4 d. per lb. and would make a Composition of 144 lb. worth 8 d. per lb. I desire to know what Quantity of each he must take?

	Answer.	Proof.
12	48 at 12 d.	576
10	24 at 10 d.	240
8	24 at 8 d.	192
4	48 at 4 d.	192
	144	1152

2. A Druggist having four Sorts of Tea, of 5 s. 6 s. 8 s. and 9 s. per lb. would have a Composition of 87 lb. worth 7 s. per lb. what Quantity must there be of each? *Ans.* 14 1/2 lb. of 5 s. 29 lb. of 6 s. 29 lb. of 8 s. and 14 1/2 lb. of 9 s.

3. A Vintner hath four Sorts of Wine, viz. White Wine, at 4 s. per Gallon, Flemish, at 6 s. per Gallon, Malaga, at 8 s. per Gallon, and Canary, at 10 s. per Gallon, would make a Mixture of 60 Gallons to be worth 5 s. per Gallon, what Quantity of each must he take? *Answer,* 45 Gallons of White Wine, 5 Gallons of Flemish, 5 Gallons of Malaga, and 5 Gallons of Canary.

4. A Grocer having four Sorts of Currants, of 11 d. 9 d. 6 d. and 4 d. the lb. is desirous of making a Composition of 240 lb. worth 8 d. the lb. how much of each must he take? *Answer,* 96 lb. at 11 d. 48 lb. at 9 d. 24 lb. at 6 d. and 72 lb. at 4 d.

5. A Goldsmith hath 4 Sorts of Gold, viz. of 24 Carats fine, of 22, 20 and 15 Carats fine, would mix as much of each Sort together, so as to have 42 oz. of 17 Carats fine, how much must he take of each? *Answer,* 4 of 24 Carats fine, 4 of 22, 4 of 20, and 30 of 15 Carats fine.

6. A Druggist having some Drugs of 8 s. 5 s. and 4 s. per lb. made them into two Parcels, one of 28 lb. at 6 s. per lb. the other of 42 lb. at 7 s. per lb. how much of every Sort did he take for each Parcel?

<i>Answer,</i> 12 lb. of 8 s.	<i>Answer,</i> 30 lb. of 8 s.
8 lb. of 5 s.	6 lb. of 5 s.
8 lb. of 4 s.	6 lb. of 4 s.
28 lb. at 6 s. per lb.	42 lb. at 7 s. per lb.

POSITION, or the RULE of FALSE,

IS a Rule, that by *false* or *supposed* Numbers, taken at Pleasure, we discover the *true* ones required.

POSITION is divided into two Parts, SINGLE and DOUBLE.

SINGLE POSITION

Is by using *one supposed* Number, and working with it as the *true* one, you find the *real* Number required by the following

RULE. As the *Total* of the *Errors* : is to the *true Total* :: so is the *supposed Number* : to the *true one* required.

PROOF. Add the several Parts of the Sum together, and if it agrees with the Sum, it is right.

EXAMPLES.

1. A School-master being asked how many Scholars he had, said, if I had as many, half as many, and one Quarter, as many more, I should have 88, how many had he?
Answer, 32.

Suppose he had	40	As 110 : 88 :: 40	32
as many --	40	40	32
Half as many	20		16
$\frac{1}{4}$ as many --	10	110)352 0(	8
	110		88 Proof.

2. A Person having about him a certain Number of Portugal Pieces, said, if the third, fourth and 6th of them were added together, they would make 54, I desire to know how many he had? *Answer, 72.*

3. A Gentleman bought a Chaise, Horse and Harness for 60 *l.* the Horse came to twice the Price of the Harness, and the Chaise to twice the Price of the Horse and Harness, what did he give for each? *Answer, Horse 13 *l.* 6 *s.* 8 *d.* Harness 6 *l.* 13 *s.* 4 *d.* Chaise 40 *l.**

4. A, B and C, being determined to buy a Quantity of Goods, which would cost them 120 *l.* agreed amongst themselves that B should have a third Part more than A, and C a fourth Part more than B. I desire to know what each Man must pay? *Answer, A 30 *l.* B 40 *l.* C 50 *l.**

ASSISTANT. *Position, or the Rule of False.* 81

5. A Man, overtaking a Maid driving a Flock of Geese, said to her, how do you do Sweetheart? Where are you going with these 30 Geese? No, Sir, said she; I have not thirty, but if I had as many more, half as many more, and 5 Geese besides, I should have thirty; how many had she? *Answer, 10*

6. A Person delivered to another a Sum of Money, unknown, to receive Interest for the same at 6 per Cent. per Annum, simple Interest, and at the End of 10 Years received for Principal and Interest 300 l. what was the Sum lent? *Answer, 187 l. 10 s.*

DOUBLE POSITION

Is by making Use of two supposed Numbers, and if both prove false, (as it generally happens) are with their Errors to be thus ordered.

RULE 1. Place each Error against its respective Position.

2. Multiply them crosswise.

3. If the Errors are alike, i. e. both greater, or both less than the given Number, take their Difference for a Divisor, and the Difference of their Products for a Dividend.

But if unlike, take their Sum for a Divisor, and the Sum of their Products for a Dividend, the Quotient will be the Answer.

EXAMPLES.

1. A B and C would divide 200 l. between them, so that B may have 6 l. more than A, and C 8 l. more than B, how much must each have?

Suppose A had 40

then B had 46

and C --- 54

140 too little by 60.

Then suppose A had 50

then B must have 56

and C --- 64

170 too little by 30.

Sup. Errors.

40 60

50 30

3000 1200

1200

3|0)180|0

60 Answer for A.

60

30

30 Divisor.

60 A

66 B

74 C

200 Proof.

2. A

22. *Position, or the Rule of False.* *The Tutor's*

2. A Man hath two Silver Cups of unequal Weight, having one Cover to both, of 5 oz. now if the Cover is put on the lesser Cup, it will be double the Weight of the greater Cup, and if set on the greater Cup, it will be thrice as heavy as the lesser Cup, what is the Weight of each Cup? *Answer, 3 oz. lesser, 4 greater.*

3. *A B* and *C* playing at Hazard together, the Money staked was 196 Guineas, but disagreeing, each seized as many as he could, *A* got a certain Quantity, *B* as many as *A* and 16 more, and *C* the sixth Part of both their Sums, how many had each? *Answer, A 76, B 92, and C 28.*

4. A Gentleman bought a House with a Garden and a Horse in the Stable for 500 *l.* now he paid 4 Times the Price of the Horse for the Garden, and 5 Times the Price of the Garden for the House, what was the Value of the House, Garden and Horse separately? *Answer, Horse 20 l. Garden 80 l. House 400 l.*

5. Three Persons discoursed concerning their Ages? says *A* I am 30 Years of Age, says *B* I am as old as *A* and $\frac{1}{4}$ of *C*, and says *C* I am as old as you both; what was the Age of each Person? *Answer, A 30, B 50, and C 80.*

6. *A B* and *C* playing at Cards, staked 324 Crowns, but disputing about the Tricks, each took as many as he could, *A* got a certain Number; *B* as many as *A* and 15 more, and *C* got a fifth Part of both their Sums added together, how many did each get? *Answer, A 127 $\frac{1}{2}$. B 142 $\frac{1}{2}$. and C 54.*

7. *A* stealing Apples, was taken by *B*, and to appease him, gives him Half he had, and *B* gives him back 10, going further, he meets *C*, who took from him Half of what he had left, and gives him back 4. After that, meeting with *D* he gives him Half of what he had, and he returns him back one, at last, getting safe away, he finds he had 13 left, how many had he at first? *Answer, 60.*

8. A Gentleman coming into a Garden, meets with some Ladies, says to them, Good Morning to you 10 fair Maids! Sir, you mistake (answered one of them) we are not 10, but if we were twice as many more as we are, we should be as many above 10 as we are now under, how many were they? *Answer, 5.*

E X-

EXCHANGE

Is the receiving of Money in one Country for the same Value paid in another.

The *Par* of Exchange is always fixed and certain, it being the intrinsic Value of Foreign Money compared with *Sterling*, but the *Course* of Exchange rises and falls upon various Occasions.

I. FRANCE.

They keep their *Accounts* at *Paris*, *Lyons*, and *Rouen*, in *Livres*, *Sols* and *Deniers*, and Exchange by the *Crown*, = 4 s. 6 d. at *Par*.

NOTE. 12 *Deniers* make 1 *Sol*.
20 *Sols* - - - - 1 *Livre*.
3 *Livres* - - - 1 *Crown*.

To change French into Sterling.

RULE. As 1 *Crown* : is to the given Rate :: so is the *French* Sum : to the *Sterling* required.

To change Sterling into French.

RULE. As the Rate of Exchange : is to 1 *Crown* :: so is the *Sterling* Sum : to the *French* required.

EXAMPLES.

1. How many *Crowns* must be paid at *Paris*, to receive in *London* 180 l. Exchange at 4 s. 6 d. per *Crown*?

d. cr. l.
As 54 : 1 :: 180 :
240 *Crowns*.
54)43200(800
432
..00

2. A Merchant at *Paris* remits to his Correspondent in *London* 800 *Crowns*, at 4 s. 6 d. each, what is the Value in *Sterling*?

cr.
1 : 54 :: 800 :
54
12)43200
20)3600
180 £.

3. How much *Sterling* must be paid in *London* to receive in *Paris* 758 *Crowns* Exchange, at 56 d per *Crown*?
Answer, 176 l. 17 s. 4 d.

34. Exchange.

The Tutor's

4. A Merchant in *London* remits 176*l.* 17*s.* 4*d.* to his Correspondent at *Paris*, what is the Value in *French Crowns*, at 56*d.* per Crown? *Answer*, 758.

5. Change 725 Crowns, 17 Sols, 8 Deniers, at 54*d.* $\frac{1}{2}$ per Crown, into Sterling, what is the Sum? *Ans.* 164*l.* 14*s.* 0*d.* $\frac{1}{2}$.

6. Change 164*l.* 14*s.* 0*d.* $\frac{1}{2}$ Sterling, into *French Crowns* Exchange, at 54*d.* $\frac{1}{2}$ per Crown? *Answer*, 725 Crowns, 17 Sols, 7 Deniers.

II. SPAIN.

They keep their Accounts at *Madrid*, *Cadiz* and *Seville*, in *Dollars*, *Rials* and *Maravedies*, and Exchange by the Piece of Eight = 4*s.* 6*d.* at *Par.*

NOTE. 34 *Maravedies* make 1 *Rial*.

8 *Rials* - - - - - 1 *Piastre*, or Piece of Eight.

10 *Rials* - - - - - 1 *Dollar*.

RULE. As with *France*.

EXAMPLES.

1. A Merchant at *Cadiz* remits to *London* 2547 Pieces of Eight, at 56*d.* per Piece, how much Sterling is the Sum? *Answer*, 594*l.* 6*s.*

2. How many Pieces of Eight, at 56*d.* each, will answer a Bill of 594*l.* 6*s.* Sterling? *Answer*, 2547.

3. If I pay a Bill here of 2500*l.* what *Spanish Money* may I draw my Bill for at *Madrid*, Exchange at 57*d.* $\frac{1}{2}$ per Piece of Eight? *Ans.* 10434 Pieces of Eight, 6 *Rials*, 8 *Mar.*

III. ITALY.

They keep their Accounts at *Genoa* and *Leghorn* in *Livres*, *Sols*, and *Deniers*, and Exchange by the Piece of Eight, or *Dollar* = 4*s.* 6*d.* at *Par.*

NOTE. 12 *Deniers* make 1 *Sol*.

20 *Sols* - - - - - 1 *Livre*.

5 *Livres* - - - - - 1 Piece of Eight at *Genoa*.

6 *Livres* - - - - - 1 Piece of Eight at *Leghorn*.

N. B. The Exchange at *Florence* is by *Ducatoons*, the Exchange at *Venice* by *Ducats*.

NOTE. 6 *Soldi* make 1 *Gross*.

24 *Grosses* - - - - - 1 *Ducat*.

RULE. The same as before.

EXAM

EXAMPLES.

1. How much *Sterling* Money may a Person receive in *London*, if he pays in *Genoa* 976 Dollars, at 53 d. per Dollar? *Answer*, 215 l. 10 s. 8 d.
2. A Merchant remitted 215 l. 10 s. 8 d. *Sterling* to *Leghorn*, how many Dollars will he receive there, the Exchange being at 53 d. per Dollar? *Answer*, 976.
3. A Factor hath sold Goods at *Florence*, for 250 Ducatoons, at 54 d. each, what is the Value in Pounds *Sterling*? *Answer*, 56 l. 5 s.
4. A Bill of 56 l. 5 s. is remitted to *Florence*, to be paid in Ducatoons, at 54 d. each, how many will be receiv'd? *Answer*, 250.
5. If 275 Ducats, at 4 s. 5 d. each, be remitted from *Venice* to *London*, what is the Value in Pounds *Sterling*? *Answer*, 60 l. 14 s. 7 d.
6. A Gentleman travelling, would exchange 60 l. 14 s. 7 d. *Sterling*, for *Venice* Ducats, at 4 s. 5 d. each, how many must he receive? *Answer*, 275.

IV. PORTUGAL.

They keep their Accounts in *Oporto* and *Lisbon*, in *Reas*, and Exchange on the *Milrea* = 6 s. 8 d. $\frac{1}{2}$ at *Par*.

NOTE, 1000 *Reas* make 1 *Milrea*.

RULE, the same with *France*.

EXAMPLES.

1. A Gentleman being desirous to remit to his Correspondent in *London* 2750 *Milreas*, Exchange at 6 s. 5 d. per *Milrea*, how much *Sterling* will he be Creditor for in *London*? *Answer*, 882 l. 5 s. 10 d.
2. If a Bill be drawn from *London* of 882 l. 5 s. 10 d. *Sterling*, how many *Milreas*, at 6 s. 5 d. each, is equal in Value to the said Sum? *Answer*, 2750.
3. A Merchant at *Oporto* remits to *London* 4366 *Milreas*, and 183 *Reas*, at 5 s. 5 d. $\frac{1}{2}$. Exchange, per *Milrea*, how much *Sterling* must be paid in *London* for this Remittance? *Answer*, 1193 l. 17 s. 6 d. $\frac{1}{2}$.
4. If I pay a Bill at *London* of 1193 l. 17 s. 6 d. $\frac{1}{2}$, what must I draw for on my Correspondent at *Lisbon*, Exchange at 5 s. 5 d. $\frac{1}{2}$. per *Milrea*? *Ans.* 4366 *Milreas*, 183 *Reas*.

V. HOLLAND, FLANDERS, and GERMANY.

They keep their Accounts at *Antwerp, Amsterdam, Brussels, Rotterdam, and Hamburg*: Some in Pounds, Shillings, and Pence, as in *England*; others in *Guilders, Stivers and Pennings*, and Exchange with us on our Pound at 33 s. 4 d. *Flemish*, at Par.

NOTE. 8 Pennings make - - - 1 Groat.
2 Groats or 16 Pennings 1 Stiver.
20 Stivers - - - - - 1 Guilder or Florin.

ALSO,

32 Groats or 6 Stivers make 1 Schelling.
20 Schellings or 6 Guilders - 1 Pound.

To change *Flemish* into *Sterling*.

RULE. As the given Rate : is to 1 Pound :: so is the *Flemish* Sum : to the *Sterling* required.

To change *Sterling* into *Flemish*.

RULE. As 1 l. *Sterling* is to the given Rate :: so is the *Sterling* given : to the *Flemish* sought.

EXAMPLES.

1. Remitted from *London* to *Amsterdam*, a Bill of 754 l. 10 s. *Sterling*, how many Pounds *Flemish* is the Sum, the Exchange at 33 s. 6 d. *Flemish* per Pound *Sterling*? Answer, 1263 l. 15 s. 9 d. *Flemish*.

2. A Merchant at *Rotterdam* remits 1263 l. 15 s. 9 d. *Flemish*, to be paid in *London*, how much *Sterling* Money must he draw for, the Exchange being at 33 s. 6 d. *Flemish*, per Pound *Sterling*? Answer, 754 l. 10 s.

3. If I pay in *London* 852 l. 12 s. 6 d. *Sterling*, how many Guilders must I draw for at *Amsterdam*, Exchange at 34 Schel. $4\frac{1}{2}$ Groats, *Flemish*, per Pound *Sterling*? Ans. 8792 Guild. 13 Stiv. $14\frac{1}{2}$ Pennings.

4. What must I draw for at *London*, if I pay at *Amsterdam* 8792 Guil. 13 Stiv. $14\frac{1}{2}$ Pennings, Exchange at 34 Schel. $4\frac{1}{2}$ Groats, per Pound *Sterling*? Answer, 852 l. 12 s 6 d.

To

To convert *Bank Money* into *Current*, and the contrary.

NOTE. *The Bank Money is worth more than the Current. The Difference between the one and the other is called Agio, and is generally from 3 to 6 per Cent. in Favour of the Bank.*

To change *Bank* into *Current Money*.

RULE. As 100 *Guilders Bank* : is to 100 with the *Agio* added : : so is the *Bank* given : to the *Current* required.

To change *Current Money* into *Bank*.

RULE. As 100 with the *Agio* added : is to 100 *Bank* : : so is the *Current Money* given : to the *Bank* required.

1. Change 794 *Guilders*, 15 *Stivers*, *Current Money*, into *Bank Florins*, *Agio* 4 $\frac{1}{2}$ per Cent.? *Ans.* 761 *Guilders*, 8 *Stivers*, 11 *Pennings*.

2. Change 761 *Guilders*, 9 *Stivers Bank*, into *Current Money*, *Agio* 4 $\frac{1}{2}$ per Cent.? *Answer*, 794 *Guild*, 15 *Stiv*, 4 *Pennings*.

VI. I R E L A N D.

1. A Gentleman remits to *Ireland* 575 *l.* 15 *s.* *Sterling*, what will he receive there, the *Exchange* being at 10 per Cent.? *Ans.* 633 *l.* 6 *s.* 6 *d.*

2. What must be paid in *London* for a Remittance of 633 *l.* 6 *s.* 6 *d.* *Irish*, *Exchange* at 10 per Cent.? *Ans.* 575 *l.* 15 *s.*

COMPARISON of WEIGHTS and MEASURES.

EXAMPLES.

1. If 50 *Dutch Pence* be worth 65 *French Pence*, how many *Dutch Pence* are equal to 350 *French Pence*? *Ans.* 269 $\frac{1}{2}$.

2. If 12 *Yards* at *London* make 8 *Ells* at *Paris*, how many *Ells* at *Paris* will make 64 *Yards* at *London*? *Ans.* 96.

I 2

3. If

88 Conjoined Proportion.

The TUTOR'S

3. If 30 lb. at London make 28 lb. at Amsterdam, how many lb. at London will be equal to 350 lb. at Amsterdam? *Ans.* 375.

4. If 95 lb. Flemish make 100 lb. English, how many lb. English are equal to 275 lb. Flemish? *Ans.* 289 $\frac{2}{3}$.

CONJOIN'D PROPORTION

IS when the *Coin, Weight or Measures* of several Countries are compared in the same Question, or it is linking together a Variety of Proportions.

When it is required to find how many of the *first* Sort of *Coin, Weight, or Measure* mentioned in the Question, are equal to a given *Quantity* of the *last*.

RULE. Place the Numbers alternately, beginning at the left Hand, and let the last Number stand on the left Hand; then multiply the first Row continually for a *Dividend*, and the second for a *Divisor*.

PROOF. By as many single Rules of Three as the Question requires.

EXAMPLES.

1. If 20 lb. at London make 23 lb. at Antwerp, and 155 at Antwerp; make 180 lb. at Leghorn, how many lb. at London are equal to 72 lb. at Leghorn?

Left. Right.

20 23

155 180

72

$$20 \times 155 \times 72 = 223200$$

$$23 \times 180 = 4140 \quad 223200 \div 4140 = 53 \frac{2}{3}$$

2. If 12 lb. at London make 10 lb. at Amsterdam, 100 lb. at Amsterdam, 120 lb. at Thoulouse, how many Pounds at London are equal to 40 lb. at Thoulouse? *Ans.* 40 lb.

3. If 140 Braces at Venice are equal to 156 Braces at Leghorn, and 7 Braces at Leghorn equal to 4 Ells English, how many Braces at Venice are equal to 16 Ells English? *Ans.* 25 — $\frac{7}{8}$.

4. If 40 lb. at London make 36 lb. at Amsterdam, and 90 lb. at Amsterdam make 116 lb. at Dantzick, how many lb. at London are equal to 130 lb. at Dantzick? *Ans.* 112 $\frac{2}{3}$.

When

ASSISTANT.

Progression.

When it is required to find how many of the *last Sort* of *Coin, Weight or Measure* mentioned in the Question, is equal to a given *Quantity of the first*.

RULE. Place the Numbers alternately, beginning at the Left Hand, and let the last Number stand on the Right Hand; then multiply the first Row for a *Divisor*, and the second for a *Dividend*.

EXAMPLES.

1. If 12 lb. at London make 10 lb. at Amsterdam, 100 lb. at Amsterdam 120 at Toulouse, how many lb. at Toulouse are equal to 40 lb. at London? *Ans.* 45 lb.

2. If 45 lb. at London make 36 lb. at Amsterdam, and 90 lb. at Amsterdam, and 116 at Dantzick, how many lb. at Dantzick are equal to 122 at London?

Answer, 129 $\frac{3312}{3800}$.

P R O G R E S S I O N

Consists in two PARTS :

ARITHMETICAL and GEOMETRICAL.

ARITHMETICAL PROGRESSION

IS when a Rank of Numbers increase or decrease regularly, by the continual adding or subtracting of some equal Number : As 1, 2, 3, 4, 5, 6, are in Arithmetical Progression by the continual increasing or adding of one, and 11, 9, 7, 5, 3, 1, by the continual Decrease or Subtraction of two.

NOTE. When any even Number of Terms differ by Arithmetical Progression, the Sum of the two Extrems will be equal to the two middle Numbers, or any two Means equally distant from the Extrems : As 2, 4, 6, 8, 10, 12, where $6+8$, the two middle Numbers, are $=12+2$, the two Extrems, and $=10+4$ the two Means $=14$.

When the Number of Terms are odd, the Double of the middle Term will be equal to the two Extrems, or of any two Means equally distant from the middle Term : As 1, 2, 3, 4, 5, where the Double of 3 $=5+1=2+4=6$.

In *Arithmetical Progression* five Things are to be observed, viz.

1. The first Term.
2. The last Term.
3. The Number of Terms.
4. The equal Difference.
5. The Sum of all the Terms.

Any three of which being given, the other two may be found,
The first, second and third Term given to find the fifth.

RULE. Multiply the Sum of the two *Extreams* by half the Number of Terms, or multiply half the Sum of the two *Extreams* by the whole Number of Terms, the Product is the Total of all the Terms.

EXAMPLES.

1. How many Strokes does the Hammer of a Clock strike in 12 Hours? *Ans.* 78.

$$12 + 1 = 13 \text{ then } 13 \times 6 = 78.$$

2. A Man buys 17 Yards of Cloth, and gave for the first Yard 2 s. and for the last 10 s. what did the 17 Yards amount to? *Ans.* 5 l. 2 s.

3. If 100 Eggs were placed in a right Line, exactly a Yard asunder from one another, and the first a Yard from a Basket, what Length of Ground does that Man go who gathers up these 100 Eggs singly, returning with every Egg to the Basket to put it in? *Ans.* 5 Miles, 1300 Yards.

The first, second and third Terms given, to find the fourth.

RULE. From the second subtract the first, the Remainder divided by the third less one gives the fourth.

EXAMPLES.

1. A Man had 8 Sons, the youngest was 4 Years old, and the eldest 32, they increase in *Arithmetical Progression*, what was the common Difference of their Ages? *Ans.* 4.

$$32 - 4 = 28 \text{ then } 28 \div 8 - 1 = 4 \text{ the common Difference.}$$

2. A Man is to travel from London to a certain Place in 12 Days, and to go but 3 Miles the first Day, increasing every

every Day by an equal Excess, so that the last Day's Journey may be 58 Miles, what is the daily Increase, and how many Miles distant is that Place from London? *Answer, 5 daily Increase.*

Therefore as 3 Miles is the first Day's Journey.

$$3+5=8 \text{ the second Day.}$$

$$8+5=13 \text{ the third Day, \&c.}$$

The whole Distance is 366 Miles.

The first, second and fourth Terms given to find the third.

RULE. From the second subtract the first, the Remainder divide by the fourth, and to the Quotient add 1, gives the third.

EXAMPLES.

1. A Person travelling into the Country, went 3 Miles the first Day, and increased every Day by 5 Miles, till at last he went 58 Miles in one Day, how many Days did he travel? *Ans. 12.*

$$58-3=55 \text{ then } 55 \div 5=11 \text{ and } 11+1=12 \text{ the Number of Days.}$$

2. A Man being asked how many Sons he had, said, that the youngest was 4 Years old, and the eldest 32, and that he increased one in his Family every four Years, how many had he? *Ans. 8.*

The second, third and fourth given, to find the first.

RULE. Multiply the fourth by the third, made less by 1, the Product subtracted from the second gives the first.

EXAMPLES.

1. A Man in 10 Days went from London to a certain Town in the Country, every Day's Journey increasing the former by 4, and the last Day he went was 46 Miles, what was the first? *Ans. 10 Miles.*

$$4 \times 10 - 1 = 36 \text{ then } 46 - 36 = 10, \text{ the first Day's Journey.}$$

2. A Man takes out of his Pocket at 8 several Times, so many different Numbers of Shillings, every one exceeding the former by 6; the last 46, what was the first? *Ans. 4.*

The

The *second*, *third* and *fifth* given, to find the *first*.

RULE. Divide the *fifth* by the *third*, and from the Quotient subtract half the Product of the *fourth* multiplied by the *third* less 1, gives the *first*.

EXAMPLE.

1. A Man is to receive 360 l. at 12 several Payments, each to exceed the former by 4 l. and is willing to bestow the first Payment on any one that can tell him what it is, what will that Person have for his Pains? *Answer*, 8 l.

$$360 \div 12 = 30 \text{ then } 30 - \frac{4 \times 12 - 1}{2} = 8. \text{ the first Payment.}$$

The *first*, *third* and *fourth* given, to find the *second*.

RULE. Subtract the *fourth* from the Product of the *third*, multiplied by the *fourth*, that Remainder added to the *first*, gives the *second*.

EXAMPLE.

1. What is the last Number of an Arithmetical Progression, beginning at 6, and continuing by the Increase of 8 to 20 Places? *Answer*, 158.

$$20 \times 8 - 8 = 152 \text{ then } 152 + 6 = 158, \text{ the last Number.}$$

GEOMETRICAL PROGRESSION

IS the increasing or decreasing of any Rank of Numbers by some common *Ratio*; that is by the continual *Multiplification*, or *Division* of some equal Number: As 2, 4, 8, 16 increase by the Multiplier 2, and 16, 8, 4, 2 decrease by the Divisor 2.

NOTE. When any Number of Terms is continued in Geometrical Progression, the Product of the two Extrems will be equal to any two Means, equally distant from the Extrems: As 2, 4, 8, 16, 32, 64, where $64 \times 2 = 4 \times 32$, and $8 \times 16 = 128$.

When the Number of Terms are odd, the middle Term multiplied into itself will be equal to the two Extrems, or any

any two Means, equally distant from the Mean: As 2, 4, 8, 16, 32, where $2 \times 32 = 4 \times 16 = 8 \times 8 = 64$.

In Geometrical Progression the same five Things are to be observed, as in Arithmetical, viz.

1. The first Term.
2. The last Term.
3. The Number of Terms.
4. The equal Difference or Ratio.
5. The Sum of all the Terms.

NOTE. As the last Term in a long Series of Numbers is very tedious to come at, by continual Multiplication; therefore, for the readier finding it out, there is a Series of Numbers made use of in Arithmetical Proportion, called Indices, beginning with an Unit, whose common Difference is one, whatever Number of Indices you make use of, set as many Numbers (in such Geometrical Proportion as is given in the Question) under them.

1, 2, 3, 4, 5, 6 Indices.

2, 4, 8, 16, 32, 64 Numbers in Geometrical Proportion.

But if the first Term in Geometrical Proportion be different from the Ratio, the Indices must begin with a Cypher.

0, 1, 2, 3, 4, 5, 6. Indices.

1, 2, 4, 8, 16, 32, 64. Numbers in Geometrical Proportion.

When the Indices begin with a Cypher, the Sum of the Indices made choice of must be always one less than the Number of Terms given in the Question, for 1 in the Indices is over the second Term, and two over the third, &c.

Add any two of the Indices together, and that Sum will agree with the Product of their respective Terms.

As in the first Table of Indices $2 + 5 = 7$

Geometrical Proportion $4 \times 32 = 128$

Then in the second $2 + 4 = 6$

$4 \times 16 = 64$

In any Geometrical Progression proceeding from Unity, the Ratio being known, to find any remote Term, without producing all the intermediate Terms.

RULE. Find what Figures of the Indices added together would give the Exponent of the Term wanted, then multiply the

the Numbers standing under such *Exponent* into each other, and it will give the *Term* required.

NOTE. When the *Exponent* 1 stands over the second *Term*, the Number of *Exponents* must be one less than the Number of *Terms*.

EXAMPLES.

1. A Man agrees for 12 Peaches, to pay only the Price of the last, reckoning a Farthing for the first, an Half-penny for the second, &c. doubling the Price to the last, what must he give for them? *Ans.* 2 l. 2 s. 8 d.

16=4
16=4
256=8
8=3

For $4+4+3=11$, N^o. of *Terms* less 1.

$$4)1048=12 \text{ N^o. of Far.}$$

$$12)512$$

$$2|04|2 \quad . \quad 8$$

$$2 \cdot 2 \cdot 8$$

2. A Country Gentleman going to a Fair to buy some Oxen, meets with a Person who had 23, he demanding the Price of them, was answer'd, 16 l. a Piece; the Gentleman bids him 15 l. a Piece, and he would buy all; the other tells him it would not be taken, but if he would give what the last Ox would come to, at a Farthing for the first, and doubling it to the last, he should have all. What was the Price of the Oxen? *Ans.* 4369 l. 1 s. 4 d.

In any *Geometrical Progression*, not proceeding from *Unity*, the *Ratio* being given, to find any remote *Term*, without producing all the intermediate *Terms*.

RULE. Proceed as in the last, only observe that every *Product* must be divided by the first *Term*.

EXAMPLE

EXAMPLES.

1. A Sum of Money is to be divided among eight Persons, the first to have 20 l. the second 60 l. and so on in triple Proportion, what will the last have? *Ans.* 43740 l.

$$\begin{array}{ccccccc} 0. & 1. & 2. & 3. & & & \\ 20. & 60. & 180. & 540. & & & \end{array} \quad \begin{array}{l} 540 \times 540 \\ \hline 20 \end{array} = 14580 \text{ then } \begin{array}{l} 14580 \times 60 \\ \hline 20 \end{array} = 43740$$

$3+3+1=7$ one less than the Number of Terms.

2. A Gentleman dying left 9 Sons, to whom and to his Executors, he bequeathed his Estate in Manner following: To his Executor 50 l. his youngest Son was to have as much more as the Executor, and each Son to exceed the next younger by as much more, what was the eldest Son's Portion? *Answer,* 25600 l.

The first Term, Ratio, and Number of Terms given, to find the Sum of all the Terms.

RULE. Find the last Term as before, then subtract the first from it, and divide the Remainder by the Ratio less one, to the Product of which add the greater, gives the Sum required.

EXAMPLES.

1. A Servant skilled in Numbers agreed with a Gentleman to serve him 12 Months, provided he would give him a Farthing for his first Month's Service, a Penny for the second, and 4 d. for the third, &c. what did his Wages amount to? *Answer.* 5825 l. 8 s. 5 d. $\frac{1}{4}$.

$$\begin{array}{ccccccc} 0. & 1. & 2. & 3. & 4. & & \\ 1. & 4. & 16. & 64. & 256. & & \end{array} \quad \begin{array}{l} 256 \times 256 = 65536, \text{ then } 65536 \times 64 = 4194304 \\ 4194304 - 1 \\ \hline = 1398101. \text{ then} \end{array}$$

$$4+4+3=11 \text{ N}^{\circ} \text{ of Terms less } 1. \quad 4-1$$

$$1398101 + 4194304 = 5592405 \text{ Farthings.}$$

2. A Man bought a Horse, and by Agreement was to give a Farthing for the first Nail, three for the second, &c. there were 4 Shoes, and in each Shoe 8 Nails, what was the Worth of the Horse? *Ans.* 965114681693 l. 13 s. 4 d.

3. A certain Person married his Daughter on New-years Day, and gave her Husband one Shilling towards her Portion,

tion, promising to double it, on the first Day of every Month for one Year, what was her Portion? *Ans.* 204 *l.* 15 *s.*

4. A Laceman well versed in Numbers agreed with a Gentleman to sell him 22 Yards of rich Gold brocaded Lace, for 2 Pins the first Yard, 6 Pins the second, &c. in triple Proportion. I desire to know what he sold the Lace for, if the Pins were valued at 100 for a Farthing; also what the Laceman got or lost by the Sale thereof, supposing the Lace stood him in 7 *l.* per Yard?

Answer, the Lace sold for 326886 *l.* 0 *s.* 9 *d.*

Gain 326732 *l.* 0 *s.* 9 *d.*

P E R M U T A T I O N

IS the changing or varying the Order of Things.

RULE. Multiply all the given Terms, one into another, and the last Product will be the Number of Changes required.

E X A M P L E S.

1. How many Changes may be rung upon 12 Bells, and how long would they be ringing but once over, supposing 10 Changes might be rung in one Minute, and the Year to contain 365 Days, 6 Hours;

$1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 \times 9 \times 10 \times 11 \times 12 = 479001600$ *Changes,*
which $\div 10 = 47900160$ *Minutes, and if reduced, is = 91*
Years, 3 Weeks, 5 Days, and 6 Hours.

2. A young Scholar coming into a Town for the Convenience of a good Library, demands of a Gentleman with whom he lodged, what his Diet would cost for a Year, who told him 10 *l.* but the Scholar not being certain what Time he should stay, asked him what he must give him for so long as he could place his Family (consisting of six Persons besides himself) in different Positions, every Day at Dinner; the Gentleman thinking it could not be long, tells him 5 *l.* to which the Scholar agrees, what Time did the Scholar stay with the Gentleman? *Ans.* 5040 *Days.*

THE TUTOR'S ASSISTANT.

PART II.

VULGAR FRACTIONS.

A FRACTION is a Part or Parts of an *Unit*, and written with two Figures, with a Line between them, as $\frac{1}{2}$, $\frac{3}{4}$, $\frac{5}{6}$, &c. The Figure above the Line is called the *Numerator*, and the under one the *Denominator*, which shews how many Parts the Unit is divided into, and the *Numerator* shews how many of those Parts are meant by the Fraction.

There are four Sorts of Vulgar Fractions, *Proper*, *Improper*, *Compound*, and *Mixed*, viz.

1. A **PROPER FRACTION** is when the Numerator is less than the Denominator, as $\frac{1}{2}$, $\frac{3}{4}$, $\frac{5}{6}$, $\frac{7}{8}$, $\frac{9}{10}$, &c.
2. An **IMPROPER FRACTION** is when the Numerator is equal to, or greater than the Denominator, as $\frac{8}{5}$, $\frac{9}{4}$, $\frac{12}{11}$, $\frac{107}{12}$, &c.
3. A **COMPOUND FRACTION** is the Fraction of a Fraction, and known by the Word *of*, as, $\frac{1}{2}$ of $\frac{3}{4}$, $\frac{2}{3}$ of $\frac{5}{7}$ of $\frac{8}{12}$, &c.
4. A **MIXED NUMBER or FRACTION** is composed of an whole Number and Fraction, as, $8\frac{2}{7}$, $17\frac{1}{2}$, $8\frac{7}{11}$, &c.

REDUCTION of VULGAR FRACTIONS.

1. **T**O reduce Fractions to a common Denominator.

RULE. Multiply each Numerator into all the Denominators, except its own, for a new Numerator, and all the Denominators for a common Denominator. Or,

1. Multiply the common Denominator by the several given Numerators separately, and divide the Product by their several Denominators, the Quotients will be the new Numerators.

EXAMPLES.

1. Reduce $\frac{2}{3}$ and $\frac{4}{7}$ to a common Denominator, *Facit* $\frac{14}{21}$, and $\frac{16}{21}$.

first num. *2d num.*

$2 \times 7 = 14$ $4 \times 4 = 16$ then $4 \times 7 = 28$ den. = $\frac{14}{28}$ and $\frac{16}{28}$.

2. Reduce $\frac{1}{2}$, $\frac{3}{4}$, and $\frac{5}{8}$ to a common Denominator. *Facit* $\frac{32}{64}$, $\frac{48}{64}$, $\frac{40}{64}$.

3. Reduce $\frac{1}{2}$, $\frac{4}{8}$, $\frac{9}{16}$, and $\frac{5}{32}$ to a common Denominator. *Facit* $\frac{3240}{3360}$, $\frac{3240}{3360}$, $\frac{3024}{3360}$, $\frac{2880}{3360}$.

4. Reduce $\frac{6}{16}$, $\frac{3}{4}$, $\frac{1}{2}$ and $\frac{3}{8}$ to a common Denominator. *Facit* $\frac{1008}{1680}$, $\frac{840}{1680}$, $\frac{240}{1680}$, $\frac{340}{1680}$.

5. Reduce $\frac{4}{5}$, $\frac{2}{3}$, $\frac{3}{7}$, and $\frac{1}{8}$ to a common Denominator. *Facit* $\frac{672}{1440}$, $\frac{160}{1440}$, $\frac{360}{1440}$, $\frac{180}{1440}$.

6. Reduce $\frac{2}{3}$, $\frac{1}{9}$, $\frac{5}{6}$, and $\frac{3}{4}$ to a common Denominator. *Facit* $\frac{720}{2160}$, $\frac{1200}{2160}$, $\frac{340}{2160}$, $\frac{1296}{2160}$.

2. To reduce a Vulgar Fraction to its lowest Terms.

RULE. Find a common Measure by dividing the lower Term by the upper, and that Divisor by the Remainder following, till nothing remain; the last Divisor is the common Measure, then divide both Parts of the Fraction by the common Measure, and the Quotients will give the Fraction required.

Note, If the common Measure happen to be 1, the Fraction is already in its lowest Term; and when a Fraction hath Cyphers at the right Hand, it may be abbreviated, by cutting them off; as $\frac{410}{318}$.

EXAMPLES.

1. Reduce $\frac{24}{32}$ to its lowest Terms. *Facit* $\frac{3}{4}$.

$24)32(1$ then $8)32(4 = 8$

com. measure. $8)24(3$

2. Re-

ASSISTANT. *Reduction of Vulgar Fractions.* 99

2. Reduce $\frac{10}{127}$ to its lowest Terms. *Facit* $\frac{6}{127}$.
3. Reduce $\frac{208}{684}$ to its lowest Terms. *Facit* $\frac{52}{171}$.
4. Reduce $\frac{192}{376}$ to its lowest Terms. *Facit* $\frac{1}{3}$.
5. Reduce $\frac{825}{960}$ to its lowest Terms. *Facit* $\frac{5}{64}$.
6. Reduce $\frac{5184}{912}$ to its lowest Terms. *Facit* $\frac{1}{4}$.

3. To reduce a mixed Number to an improper Fraction.

RULE. Multiply the whole Number by the Denominator of the Fraction, and to the Product add the Numerator for a new Numerator, which place over the Denominator.

Note, To express an whole Number Fraction-ways, set 1 for the Denominator given.

EXAMPLES.

1. Reduce $18 \frac{3}{7}$ to an improper Fraction. *Facit* $\frac{129}{7}$.

$$18 \times 7 + 3 = 129 \text{ new numerator, } \frac{129}{7}.$$

2. Reduce $56 \frac{13}{21}$ to an improper Fraction. *Facit* $\frac{1245}{21}$.
3. Reduce $183 \frac{5}{21}$ to an improper Fraction. *Facit* $\frac{3848}{21}$.
4. Reduce $13 \frac{4}{3}$ to an improper Fraction. *Facit* $\frac{69}{3}$.
5. Reduce $27 \frac{2}{9}$ to an improper Fraction. *Facit* $\frac{245}{9}$.
6. Reduce $514 \frac{3}{16}$ to an improper Fraction. *Facit* $\frac{8229}{16}$.

4. To reduce an improper Fraction to its proper Terms.

RULE. Divide the upper Term by the lower.

EXAMPLES.

1. Reduce $\frac{129}{7}$ to its proper Terms. *Facit* $18 \frac{3}{7}$.

$$129 \div 7 = 18 \frac{3}{7}.$$

2. Reduce $\frac{1245}{21}$ to its proper Terms. *Facit* $56 \frac{13}{21}$.
3. Reduce $\frac{3848}{21}$ to its proper Terms. *Facit* $183 \frac{5}{21}$.
4. Reduce $\frac{69}{3}$ to its proper Terms. *Facit* $13 \frac{4}{3}$.
5. Reduce $\frac{245}{9}$ to its proper Terms. *Facit* $27 \frac{2}{9}$.
6. Reduce $\frac{8229}{16}$ to its proper Terms. *Facit* $514 \frac{3}{16}$.

5. To reduce a compound Fraction to a single one.

RULE. Multiply all the Numerators for a new Numerator, and all the Denominators for a new Denominator. Reduce the new Fraction to its lowest Terms by Rule 2.

EXAMPLES.

1. Reduce $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{5}{8}$ to a single Fraction.

Facit $\frac{2 \times 3 \times 5}{3 \times 4 \times 8} = \frac{30}{96}$ reduced to its lowest Terms $= \frac{5}{16}$.

2. Reduce $\frac{3}{5}$ of $\frac{4}{7}$ of $\frac{11}{12}$ to a single Fraction.

Facit $\frac{3 \times 4 \times 11}{5 \times 7 \times 12} = \frac{132}{420}$.

3. Reduce $\frac{1}{2}$ of $\frac{1}{4}$ of $\frac{2}{3}$ to a single Fraction.

Facit $\frac{1 \times 1 \times 2}{2 \times 4 \times 3} = \frac{2}{24}$.

4. Reduce $\frac{3}{4}$ of $\frac{5}{6}$ of $\frac{9}{10}$ to a single Fraction.

Facit $\frac{3 \times 5 \times 9}{4 \times 6 \times 10} = \frac{9}{16}$.

5. Reduce $\frac{4}{5}$ of $\frac{6}{8}$ of $\frac{7}{9}$ to a single Fraction.

Facit $\frac{4 \times 6 \times 7}{5 \times 8 \times 9} = \frac{7}{15}$.

6. Reduce $\frac{8}{9}$ of $\frac{5}{7}$ of $\frac{3}{10}$ to a single Fraction.

Facit $\frac{8 \times 5 \times 3}{9 \times 7 \times 10} = \frac{8}{63}$.

6. To reduce Fractions of one Denomination to the Fraction of another, but greater, retaining the same Value.

RULE. Reduce the given Fraction to a compound one by comparing it with all the Denominations between it and that Denomination which you would reduce it to then reduce that compound Fraction to a single one.

EXAMPLES.

1. Reduce $\frac{1}{2}$ of a Penny to the Fraction of a Pound

Facit $\frac{1}{2}$ of $\frac{1}{12}$ of $\frac{1}{20} = \frac{1}{1200} l.$

2. Reduce $\frac{1}{4}$ of a Penny to the Fraction of a Pound

Facit $\frac{1}{800} l.$

3. Reduce $\frac{4}{5}$ of a *dwt.* to the Fraction of a *lb.* Troy

Facit $\frac{4}{1200} lb.$

4. Reduce $\frac{4}{7}$ of a *lb.* Avoirdupoise to the Fraction of a

cwt. *Facit* $\frac{4}{175} cwt.$

7. To reduce Fractions of one Denomination to the Fraction of another, but less, retaining the same Value.

RULE. Multiply the Numerator by the Parts contained in the several Denominations between it, and that you would reduce it to, for a new Numerator, and place it over the given Denominator.

Reduce the new Fraction to its lowest Terms.

EXAMPLES.

1. Reduce $\frac{7}{1920}$ of a *l.* to the Fraction of a Penny.
Facit $\frac{1}{4}$ of a Penny.

$7 \times 20 \times 12 = 1680$ $\frac{1680}{1920}$ reduced to its lowest Terms $= \frac{7}{4} d.$

2. Reduce $\frac{1}{960}$ of a *l.* to the Fraction of a Penny.
Facit $\frac{1}{4} d.$

3. Reduce $\frac{4}{1280}$ of a *lb.* Troy to the Fraction of a Penny-weight. Facit $\frac{1}{2}$ dwt.

4. Reduce $\frac{1}{784}$ of an *cwt.* to the Fraction of a *lb.*
Facit $\frac{1}{4} lb.$

8. To reduce Fractions of one Denomination to another of the same Value, having the Numerator given of the required Fraction.

RULE. As the Numerator of the given Fraction : is to its Denominator :: so is the Numerator of the intended Fraction : to its Denominator.

EXAMPLES.

1. Reduce $\frac{2}{3}$ to a Fraction of the same Value, whose Numerator shall be 12. As $2 : 3 :: 12 : 18$. Facit $\frac{12}{18}$.

2. Reduce $\frac{1}{4}$ to a Fraction of the same Value, whose Numerator shall be 25. Facit $\frac{25}{100}$.

3. Reduce $\frac{1}{4}$ to a Fraction of the same Value, whose Numerator shall be 47. Facit $\frac{47}{65} \frac{1}{4}$.

9. To reduce Fractions from one Denomination to another of the same Value, having the Denominator given of the Fraction required.

RULE. As the Denominator of the given Fraction : is to its Numerator :: so is the Denominator of the intended Fraction : to its Numerator.

EXAMPLES.

1. Reduce $\frac{2}{3}$ to a Fraction of the same Value, whose Denominator shall be 18. As $3 : 2 :: 18 : 12$ Facit $\frac{12}{18}$.

2. Reduce $\frac{1}{4}$ to a Fraction of the same Value, whose Denominator shall be 35. Facit $\frac{35}{140}$.

3. Reduce $\frac{1}{4}$ to a Fraction of the same Value, whose Denominator shall be 65 $\frac{1}{4}$. Facit $\frac{47}{65} \frac{1}{4}$.

10. To reduce a mixed Fraction to a single one.

RULE. When the Numerator is the integral Part, multiply it by the Denominator of the fractional Part, adding in the Numerator of the fractional Part, for a new Numerator, then multiply the Denominator of the Fraction by the Denominator of the fractional Part for a new Denominator.

EXAMPLES.

1. Reduce $36\frac{2}{3}$ to a simple Fraction. *Facit* $\frac{110}{144} = \frac{55}{72}$.

$$36 \times 3 + 2 = 110 \text{ Numerator.}$$

$$48 \times 3 = 144 \text{ Denominator.}$$

2. Reduce $23\frac{7}{8}$ to a simple Fraction. *Facit* $\frac{186}{64} = \frac{46\frac{1}{2}}{16}$.

When the Denominator is the integral Part, multiply it by the Denominator of the fractional Part, adding in the Numerator of the fractional Part for a new Denominator, then multiply the Numerator of the Fraction by the Denominator of the fractional Part for a new Numerator.

EXAMPLES.

1. Reduce $\frac{47}{65\frac{2}{3}}$ to a simple Fraction. *Facit* $\frac{235}{195} = \frac{47}{39}$.

2. Reduce $\frac{19}{44\frac{1}{2}}$ to a simple Fraction. *Facit* $\frac{37}{89} = \frac{37}{89}$.

31. To find the proper Quantity of a Fraction in the known Parts of an Integer.

RULE. Multiply the Numerator by the common Parts of the Integer, and divide by the Denominator.

EXAMPLES.

1. Reduce $\frac{1}{4}$ of a Pound Sterling to its proper Quantity, $3 \times 20 = 60 \div 4 = 15s.$ *Facit* 15s.

2. Reduce $\frac{2}{3}$ of a Shilling to its proper Quantity. *Facit* 4d. 3qrs. $\frac{1}{3}$.

3. Reduce $\frac{1}{4}$ of a lb. Avoirdupoise to its proper Quantity. *Facit* 9oz. 2dr. $\frac{2}{7}$.

4. Reduce $\frac{2}{5}$ of an cwt. to its proper Quantity. *Facit* 3qrs. 3lb. 1oz. 12dr. $\frac{4}{5}$.

5. Reduce $\frac{1}{3}$ of a lb. Troy to its proper Quantity. *Facit* 7oz. 4dwt.

6. Reduce

ASSISTANT. Reduction of Vulgar Fractions. 103

6. Reduce $\frac{3}{4}$ of an Ell English to its proper Quantity. *Facit* 2 qrs. 3 nails $\frac{3}{8}$.
7. Reduce $\frac{1}{4}$ of a Mile to its proper Quantity. *Facit* 6 furlongs, 16 poles.
8. Reduce $\frac{1}{4}$ of an Acre to its proper Quantity. *Facit* 2 roods, 20 poles.
9. Reduce $\frac{5}{7}$ of an Hoghead of Wine to its proper Quantity. *Facit* 54 gallons.
10. Reduce $\frac{3}{8}$ of a Barrel of Beer to its proper Quantity. *Facit* 12 gallons.
11. Reduce $\frac{1}{2}$ of a Chaldron of Coals to its proper Quantity. *Facit* 15 bush.
12. Reduce $\frac{1}{3}$ of a Month to its proper Quantity. *Facit* 2 weeks, 2 days, 19 hours $\frac{1}{3}$.

12. To reduce any given Quantity to the Fraction of any greater Denomination retaining the same Value.

RULE. Reduce the given Quantity to the lowest Term mentioned for a Numerator, under which set the Integral Part (reduced to the same Term) for a Denominator, and it will give the Fraction required.

EXAMPLES.

1. Reduce 15 s. to the Fraction of a Pound Sterling. *Facit* $\frac{15}{20} = \frac{3}{4}$.
2. Reduce 4 d. 3 qrs. $\frac{1}{2}$ to the Fraction of a Shilling. *Facit* $\frac{17}{20}$ s.
3. Reduce 9 oz. 2 dr. $\frac{3}{4}$ to the Fraction of a lb. *Avoir-du-pois*. *Facit* $\frac{11}{16}$ lb.
4. Reduce 3 qrs. 3 lb. 1 oz. 12 dr. $\frac{1}{2}$ to the Fraction of an cwt. *Facit* $\frac{17}{20}$ cwt.
5. Reduce 7 oz. 4 dwt. to the Fraction of a lb. *Troy*. *Facit* $\frac{11}{16}$ lb.
6. Reduce 2 qrs. 3 nails $\frac{3}{8}$ to the Fraction of an English Ell. *Facit* $\frac{5}{8}$.
7. Reduce 6 furlongs, 16 poles, to the Fraction of a Mile. *Facit* $\frac{1}{4}$.
8. Reduce 2 roods 20 poles to the Fraction of an Acre. *Facit* $\frac{1}{4}$.
9. Reduce 54 gallons to the Fraction of an Hoghead of Wine. *Facit* $\frac{3}{8}$.
10. Reduce

SUBTRACTION of Vulgar Fractions. The TUTOR.

- VIII 10. Reduce 12 gallons to the Fraction of a Barrel of Beer. *Facit* $\frac{2}{3}$.
11. Reduce 15 bush. to the Fraction of a Chaldron of Coals. *Facit* $\frac{5}{8}$.
12. Reduce 2 weeks 2 days, 19 hours, $\frac{1}{2}$ to the Fraction of a Month. *Facit* $\frac{3}{4}$.

ADDITION of VULGAR FRACTIONS.

RULE 1. **R**EDUCE the given Fractions to a common Denominator; then add all the Numerators together, under which place the common Denominator.

EXAMPLES.

1. Add $\frac{2}{3}$ and $\frac{1}{4}$ together. *Facit* $\frac{11}{12}$.
2. Add $\frac{1}{2}$, $\frac{2}{7}$, and $\frac{3}{8}$ together. — — — *Facit* $1 \frac{41}{56}$.
3. Add $\frac{1}{3}$, $4 \frac{1}{3}$, and $\frac{2}{3}$ together. — — *Facit* $4 \frac{4}{3}$.
4. Add $7 \frac{2}{3}$ and $\frac{1}{3}$ together. — — — *Facit* $8 \frac{1}{3}$.
5. Add $\frac{2}{3}$ and $\frac{1}{3}$ of $\frac{1}{2}$ together. — — — *Facit* $\frac{1}{2}$.
6. Add $5 \frac{2}{3}$, $6 \frac{1}{3}$ and $4 \frac{1}{2}$ together. — *Facit* $17 \frac{1}{2}$.
2. When the Fractions are of several Denominations, reduce them to their proper Quantities, and add as before.
7. Add $\frac{3}{4}$ of a Pound to $\frac{1}{2}$ of a Shilling. *Facit* 15 s. 10 d.
8. Add $\frac{1}{2}$ of a Penny to $\frac{1}{3}$ of a Pound. *Facit* 13 s. 4 d. $\frac{1}{2}$.
9. Add $\frac{1}{2}$ of a lb. Troy to $\frac{1}{6}$ of an Ounce. *Facit* 9 oz. $\frac{1}{3}$ dr.
10. Add $\frac{1}{2}$ of a Ton to $\frac{1}{6}$ of a lb. *Facit* 16 cwt. 0 qr. 13 oz. 5 dr. $\frac{1}{3}$.
11. Add $\frac{2}{3}$ of a Chaldron to $\frac{1}{3}$ of a Bushel. *Facit* 24 bush. 3 pecks.
12. Add $\frac{1}{6}$ of a Yard to $\frac{1}{3}$ of an Inch. *Facit* 6 in. 2 br.

SUBTRACTION of VULGAR FRACTIONS.

RULE 1. **R**EDUCE the given Fractions to a common Denominator, then subtract the lesser Numerator from the greater, and place the Remainder over the common Denominator.

2. When the lower Fraction is greater than the upper, subtract the Numerator of the lower Fraction from the Deno-

Denominator, and to that Difference add the upper Numerator, carrying one to the Units Place of the lower whole Number.

EXAMPLES.

1. From $\frac{3}{4}$ take $\frac{5}{7}$. $3 \times 7 = 21$. $5 \times 4 = 20$. $21 - 20 = 1$ num.
 $4 \times 7 = 28$ den. *Facit* $\frac{1}{28}$.
2. From $\frac{5}{8}$ take $\frac{3}{4}$ of $\frac{5}{8}$. - - - *Facit* $\frac{11}{32}$.
3. From $5 \frac{2}{3}$ take $\frac{9}{10}$. - - - *Facit* $4 \frac{23}{30}$.
4. From $\frac{3}{4}$ take $\frac{5}{7}$. - - - *Facit* $\frac{1}{28}$.
5. From $\frac{1}{8}$ take $\frac{3}{4}$ of $\frac{1}{8}$. - - - *Facit* $\frac{1}{32}$.
6. From $64 \frac{1}{4}$ take $\frac{3}{4}$ of $\frac{1}{4}$. - - - *Facit* $63 \frac{3}{4}$.

When the Fractions are of several Denominations, reduce them to their proper Quantities, and subtract as before.

7. From $\frac{1}{4}$ of a Pound take $\frac{1}{4}$ of a Shilling. *Facit* 14s. 3d.
8. From $\frac{2}{3}$ of a Shilling take $\frac{1}{2}$ of a Penny. *Facit* 7d. $\frac{1}{2}$.
9. From $\frac{1}{4}$ of a lb. Troy, take $\frac{1}{8}$ of an Ounce. *Facit* 8 oz.
16 dwt. 16 gr.
10. From $\frac{1}{2}$ of a Ton take $\frac{5}{6}$ of a lb. *Facit* 15 cwt. 3 qrs.
27 lb. 2 oz. 10 dr. $\frac{2}{3}$.
11. From $\frac{2}{3}$ of a Chaldron take $\frac{1}{4}$ of a Bushel. *Facit* 23
bush. 1 peck.
12. From $\frac{1}{6}$ of a Yard, take $\frac{2}{3}$ of an Inch. *Facit* 5 in. 1 bc.

MULTIPLICATION of VULGAR FRACTIONS.

RULE. **P**REPARE the given Numbers (if they require it) by the Rules of Reduction, then multiply the Numerators together for a new Numerator, and the Denominators for a new Denominator.

Note. When any Number, either whole or mixed, is multiplied by a Fraction, the Product will be always less than the Multiplicand, in the same Proportion as the multiplying Fraction is less than an Unit.

EXAMPLES.

1. Multiply $\frac{3}{4}$ by $\frac{3}{4}$. *Facit* $3 \times 3 = 9$ num. $4 \times 5 = 20$ den. $= \frac{9}{20}$.
2. Multiply $\frac{7}{8}$ by $\frac{3}{4}$. - - - *Facit* $\frac{21}{32}$.
3. Multiply $48 \frac{3}{4}$ by $13 \frac{5}{8}$. - - - *Facit* 672 $\frac{3}{8}$.
4. Multiply $430 \frac{9}{10}$ by $18 \frac{1}{4}$. - - - *Facit* 7935 $\frac{3}{4}$.
5. Multiply

106 Division of Vulgar Fractions. The TUTOR'S

5. Multiply $\frac{16}{11}$ by $\frac{3}{4}$ of $\frac{5}{7}$ of $\frac{4}{5}$. - Facit $\frac{26}{94} = \frac{16}{49}$.
6. Multiply $\frac{9}{10}$ by $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{5}{6}$. - Facit $\frac{3}{8}$.
7. Multiply $\frac{1}{4}$ of $\frac{2}{3}$ by $\frac{2}{3}$ of $\frac{1}{3}$. - - Facit $\frac{1}{9}$.
8. Multiply $\frac{1}{4}$ of $\frac{3}{8}$ by $\frac{5}{7}$. - - - Facit $\frac{15}{112}$.
9. Multiply $5\frac{6}{7}$ by $\frac{5}{6}$. - - - Facit $4\frac{1}{2}$.
10. Multiply 24 by $\frac{2}{3}$. - - - Facit 16.
11. Multiply $\frac{3}{4}$ of 9 by $\frac{7}{8}$. - - - Facit $5\frac{3}{8}$.
12. Multiply $9\frac{1}{2}$ by $\frac{2}{3}$. - - - Facit $3\frac{1}{6}$.

DIVISION of VULGAR FRACTIONS.

RULE. PREPARE the given Numbers (if they require it) by the Rules of Reduction, then multiply the Denominator of the Divisor into the Numerator of the Dividend for a new Numerator, and the Numerator of the Divisor into the Denominator of the Dividend for a new Denominator.

Note. When any whole Number is divided by a Fraction less than Unity, the Quotient will be greater than the Dividend. But if any Fraction be divided by a whole Number greater than Unity the Quotient will be less than the Dividend.

EXAMPLES.

1. Divide $\frac{9}{10}$ by $\frac{3}{4}$. $5 \times 9 = 45$, num. $3 \times 20 = 60$ den. $\frac{45}{60} = \frac{3}{4}$.
2. Divide $\frac{1}{2}$ by $\frac{2}{3}$. - - - Facit $\frac{3}{4}$.
3. Divide 672 $\frac{9}{10}$ by $13\frac{5}{8}$. - - Facit $48\frac{3}{8}$.
4. Divide 7935 $\frac{2}{3}$ by $18\frac{3}{4}$. - - Facit $430\frac{6}{10}$.
5. Divide $\frac{3}{8}$ by $\frac{2}{3}$ of $\frac{1}{4}$ of $\frac{5}{6}$. - - Facit $\frac{9}{16}$.
6. Divide $\frac{2}{3}$ of 16 by $\frac{5}{7}$ of $\frac{1}{4}$. - - Facit $19\frac{1}{2}$.
7. Divide $\frac{1}{2}$ of $\frac{2}{3}$ by $\frac{2}{3}$ of $\frac{1}{4}$. - - Facit $\frac{2}{3}$.
8. Divide $9\frac{2}{3}$ by $\frac{1}{2}$ of 7. - - Facit $2\frac{1}{3}$.
9. Divide $\frac{9}{10}$ by $4\frac{1}{2}$. - - - Facit $\frac{1}{5}$.
10. Divide 16 by 24. - - - Facit $\frac{2}{3}$.
11. Divide 5205 $\frac{2}{10}$ by $\frac{4}{5}$ of 91 - Facit $71\frac{1}{2}$.
12. Divide $3\frac{1}{8}$ by $9\frac{1}{2}$. - - - Facit $\frac{2}{8}$.

The SINGLE RULE of THREE DIRECT, in VULGAR FRACTIONS.

RULE. **R**EDUCE the Numbers as before directed in Reduction, so that the first and third may be of the same Name, multiply the Numerator of the first Fraction by the Denominator of the second and third, for a new Denominator, then multiply the Denominator of the first Fraction by the Numerator of the second and third for a new Numerator, that Fraction will be the Answer to the Question, which reduce to its proper Quantity—or when the 3 Terms are properly reduced, proceed as in the Rule of Three of whole Numbers.

EXAMPLES.

1. If $\frac{3}{4}$ of a Yard cost $\frac{1}{8}$ of a *l.* what will $\frac{9}{10}$ of a Yard come to at that Rate? *Answer,* $\frac{1}{8} \frac{3}{4} \text{ l.} = 15 \text{ s.}$

$$\frac{3}{4} \text{ yds.} : \frac{1}{8} \text{ l.} :: \frac{9}{10} \text{ yds.} : \frac{1}{8} \frac{3}{4} \text{ l.}$$

for $4 \times 5 \times 9 = 180 \text{ num.}$ or $\frac{3}{4} \times \frac{9}{10} = \frac{27}{40} \frac{1}{8} \frac{3}{4} (\frac{1}{8} \frac{3}{4})$
and $3 \times 8 \times 10 = 240 \text{ den.}$

2. If $\frac{5}{6}$ of a Yard cost $\frac{2}{3}$ *l.* what will $\frac{1}{2}$ Yard cost? *Answer,* 14 s. 8 d.

3. If $\frac{3}{4}$ of a Yard of Lawn cost 7 s. 3 d. what will 9 Yards $\frac{1}{2}$? *Answer,* 4 l. 10 s. 2 d. $\frac{1}{2}$ $\frac{3}{4}$.

4. If $\frac{1}{2}$ lb. cost $\frac{1}{4}$ s. how many will $\frac{3}{8}$ of s. buy? *Answer,* 1 lb. $\frac{3}{8}$.

5. If $\frac{3}{5}$ Ell of Holland cost $\frac{1}{3}$ *l.* what will 12 Ells $\frac{2}{3}$ cost at that Rate? *Answer,* 7 l. 0 s. 8 d. 3 qrs. $\frac{1}{2}$ $\frac{2}{3}$.

6. If 12 $\frac{1}{2}$ Yards of Cloth cost 15 s. 9 d. what will 48 $\frac{1}{2}$ cost at the same Rate? *Answer,* 3 l. 0 s. 9 d. $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$.

7. If $\frac{9}{10}$ of cwt. cost 284 s. what will 7 cwt. $\frac{1}{2}$ cost at the same Rate? *Answer,* 118 l. 6 s. 8 d.

8. If 3 Yards of Broad-Cloth cost 2 l. $\frac{1}{2}$, what will 10 Yards $\frac{2}{3}$ cost? *Answer,* 9 l. 12 s.

9. If $\frac{1}{4}$ of a Yard cost $\frac{2}{3}$ of a *l.* what will $\frac{3}{5}$ of an Ell *English* come to at the same Rate? *Answer,* 2 l.

10. If 1 lb. of Cochineal cost 1 l. 5 s. what will 36 lb. come to? *Answer,* 45 l. 17 s. 6 d.

11. If 1 Yard of Broad-cloth cost 15 s. $\frac{3}{4}$, what will 4 Pieces cost, each containing 27 Yds. $\frac{3}{4}$? *Ans.* 85 l. 14 s. 3 d. $\frac{1}{4}$ $\frac{3}{4}$ $\frac{3}{4}$.

12. Bought 3 Pieces $\frac{1}{2}$ of Silk, each containing 24 Ells at 6 s. 0 d. $\frac{1}{4}$ per Ell, I desire to know what the whole Quantity cost? *Answer,* 25 l. 17 s. 2 d. 1 qr. $\frac{1}{4}$ $\frac{1}{4}$.

The

The SINGLE RULE of THREE INVERSE, in VULGAR FRACTIONS.

EXAMPLES.

1. **I**F 48 Men can build a Wall in 24 Days $\frac{1}{4}$, how many Men can do the same in 192 Days? *Answer, 6 men $\frac{4}{8}$.*
2. If 25 s. $\frac{7}{8}$ will pay for the Carriage of an *cwt.* 145 Miles $\frac{1}{4}$, how far may 6 *cwt.* $\frac{1}{2}$ be carried for the same Money? *Answer, 22 miles $\frac{3}{8}$.*
3. If 3 $\frac{1}{2}$ Yards of Cloth, that is 1 $\frac{1}{2}$ Yard wide, be sufficient to make a Cloke, how much must I have of that Sort, which is $\frac{3}{4}$ Yard wide, to make another of the same Bigness? *Answer, 4 $\frac{7}{8}$ yards.*
4. If 3 Men can do a Piece of Work in 4 Hours $\frac{1}{2}$, in how many Hours will 10 Men do the same Work? *Answer, 1 hour $\frac{7}{10}$.*
5. If the Penny white Loaf weigh 7 oz. when a Bushel of Wheat cost 5 s. 6d. what is the Bushel worth, when the Penny white Loaf weighs but 2 oz. $\frac{1}{2}$? *Answer, 15 s. 4 d. $\frac{3}{4}$.*
6. What Quantity of Shalloon that is $\frac{3}{4}$ Yard wide will line 7 $\frac{1}{2}$ Yards of Cloth that is 1 $\frac{1}{2}$ Yard wide? *Ans. 15 yds.*

The DOUBLE RULE of THREE, in VULGAR FRACTIONS.

EXAMPLES.

1. **I**F a Carrier receives 2 l. $\frac{1}{10}$ for the Carriage of 3 *cwt.* 150 Miles, how much ought he to receive for the Carriage of 7 *cwt.* 3 qrs. $\frac{1}{2}$ 50 Miles. *Answer, 1 l. 16 s. 9 d.*
2. If 100 l. in 12 Months gain 6 l. Interest, what Principal will gain 3 l. $\frac{3}{4}$ in 9 Months? *Answer, 75 l.*
3. If 9 Students spend 10 l. $\frac{3}{4}$ in 18 Days, how much will 20 Students spend in 30 Days? *Ans. 39 l. 18 s. 4 d. $\frac{3}{4}$.*
4. A Man and his Wife having laboured 1 Day, earned 4 s. $\frac{5}{8}$, how much must they have for 10 Days $\frac{1}{2}$, when their two Sons help them? *Answer, 4 l. 17 s. 1 d. $\frac{1}{2}$.*
5. If 50 l. in 5 Months gain 2 l. $\frac{3}{4}$, what Time will 13 l. $\frac{1}{2}$ require to gain 1 l. $\frac{1}{2}$? *Answer, 9 months.*
6. If the Carriage of 60 *cwt.* 20 Miles cost 14 l. $\frac{1}{2}$, what Weight can I have carried 30 Miles for 5 l. $\frac{1}{10}$? *Answer, 15 *cwt.**

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THE TUTOR'S ASSISTANT.

PART III.

DECIMAL FRACTIONS.

N Decimal Fractions the Integer or whole Thing, as one Pound, one Yard, one Gallon, &c. is supposed to be divided into ten equal Parts, and those Parts into Tenths, and so on without End.

So that the Denominator of a Decimal, being always known to consist of an Unit, with as many Cyphers as the Numerator has Places, therefore is never set down, the Parts being only distinguished from whole Numbers, by a Comma prefixed; thus, ,5 which stands for $\frac{5}{10}$, ,25 for $\frac{25}{100}$, ,123 for $\frac{123}{1000}$.

But the different Value of Figures appears plainer by the following Table.

Whole Numbers.					Decimal Parts.				
7	6	5	4	3	2	1	2	3	4
Millions.	C	X	T	H	U	P	P	P	P
	of	of	of	of	Units.	Parts of	Parts of	Parts of	Parts of
	Thousands.	Thousands.	Thousands.	Hundreds.		Thousands.	Hundreds.	Thousands.	Thousands.

From which it plainly appears, that as whole Numbers increase in a ten-fold Proportion to the left Hand, Decimal

mal Parts decrease in a ten-fold Proportion to the right Hand, so that Cyphers placed before Decimal Parts decrease their Value, by removing them farther from the Comma, or Unit's Place; thus, .5 is 5 Parts of 10, or $\frac{5}{10}$. .05 is 5 Parts of 100, or $\frac{5}{100}$. .005 is 5 Parts of 1000, or $\frac{5}{1000}$. .0005 is 5 Parts of 10000, or $\frac{5}{10000}$. But Cyphers after Decimal Parts do not alter their Value. For .5, .50, .500, &c. are each but $\frac{5}{10}$ of the Unit.

A **FINITE DECIMAL** is that which ends at a certain Number of Places, but an **Infinite** is that which no where ends.

A **RECURRING DECIMAL** is that wherein one or more Figures are continually repeated, as 2,75222.

And 52,275275275 is called a compound recurring Decimal.

Note. A finite Decimal may be considered as infinite, by making Cyphers to recur, for they do not alter the Value of the Decimal.

In all Operations, if the Result consists of several Nines, reject them, and make the next superior Place an Unit more; thus, for 26,25999, write 26,6.

In all circulating Numbers dash the first Figure; thus, 27;54666.

ADDITION of DECIMALS.

RULE. **I**N setting down the proposed Numbers to be added, great Care must be taken in placing every Figure directly underneath those of the same Value, whether they be mixed Numbers, or pure Decimal Parts, and to perform which there must be a due Regard had to the Comma's, or separating Points, which ought always to stand in a direct Line, one under another, and to the right Hand of them carefully place the Decimal Parts, according to their respective Values, then add them as in whole Numbers.

EXAMPLES.

1. Add $72,5 + 32,071 + 2,1574 + 371,4 + 2,75$. *Facit*
480,8784.
2. Add $50,007 + 2,0071 + 59,4 + 3207,1$.
3. Add $3,5 + 47,25 + 927,01 + 2,0073 + 1,5$.
4. Add $52,75 + 4721 + 724 + 31,45 + 2,3075$.
5. Add $3275 + 27,514 + 1,005 + 725 + 7,32$.
6. Add. $27,5 + 52 + 3,2075 + 7541 + 2710$.

SUBTRACTION of DECIMALS.

RULE. **S**UBTRACTION of Decimals differ but little from whole Numbers, only in placing your Numbers, which must be carefully observed, as in Addition.

EXAMPLES.

- | | |
|----------------------------|----------------------------|
| 1. From ,2754 take ,2371 | 5. From 572 take 54,72 |
| 2. From 2,37 take 1,76 | 6. From 625 take 76,91 |
| 3. From 271 take 215,7 | 7. From 23,415 take ,37426 |
| 4. From 270,2 take 75,4075 | 8. From ,107 take ,0007 |

MULTIPLICATION of DECIMALS.

RULE. **P**LACE the Factors, and multiply them as in whole Numbers, and from the Product towards the right Hand, cut off as many Places for Decimals as there are in both Factors together; but if there should not be so many Places in the Product supply the Defect with Cyphers to the Left Hand.

EXAMPLES.

- | | |
|---|-----------------------------|
| 1. Multiply ,2365 by ,2435 <i>Facit</i> ,05758775 | |
| 2. Multiply 2,071 by ,2,27 | 7. Multiply 27,25 by 7,0071 |
| 3. Multiply 27,12 by 25,3 | 8. Multiply 5,721 by ,0075 |
| 4. Multiply 79,347 by 23,15 | 9. Multiply ,007 by 907 |
| 5. Multiply 2714 by ,3257 | 10. Multiply 2,015 by ,2705 |
| 6. Multiply 17105 by ,0237 | 11. Multiply ,0007 by ,0025 |

When any Number of Decimals is to be multiplied by 10, 100, 1000, &c. it is only removing the separating Point in the Multiplicand, so many Places towards the Right Hand as there are Cyphers in the Multiplier, thus, $,578 \times 10 = 5,78$ $,578 \times 100 = 57,8$ $,578 \times 1000 = 578$, $,578 \times 10000 = 5780$.

Contracted MULTIPLICATION of DECIMALS.

RULE. **P**UT the Units Place of the Multiplier under that Place of the Multiplicand that is intended to be kept in the Product; then invert the Order of all the other Figures, *i. e.* write them all the contrary Way; then in multiplying, begin at that Figure in the Multiplicand which stands over the Figure you are then multiplying withal, and set down the first Figure of each particular Product, directly one under the other, and have a due Regard to the Increase arising from the Figures on the right Hand of that Figure you begin to multiply at in the Multiplicand.

Note, That in multiplying the Figure left out every Time next the right Hand in the Multiplicand, if the Product be 5, or upwards, to 15 carry 1, if 15, or upwards, to 25 carry 2, and if 25, or upwards, to 35 carry 3, &c.

EXAMPLES.

1. Multiply 384,672158 by 36,8345 and let there be only 4 Places of Decimals in the Product. *Facit* 14169,2065.

Contracted Way.

$$\begin{array}{r}
 384,672158 \\
 5438,63 \\
 \hline
 115401647 \\
 23080329 \\
 3077377 \\
 115402 \\
 15387 \\
 1923 \\
 \hline
 14169,2065
 \end{array}$$

Common Way.

$$\begin{array}{r}
 384,672158 \\
 36,8345 \\
 \hline
 1923|360790 \\
 15386|88632 \\
 115401|6474 \\
 3077377|264 \\
 23080329|48 \\
 115401647|4 \\
 \hline
 14169,2066|038510
 \end{array}$$

2. Multiply 3,141592 by 52,7438 and leave only 4 Places of Decimals. *Facit* 165,6994
3. Multiply 2,38645 by 8,2175 and leave only 4 Places of Decimals. *Facit* 19,6107
4. Multiply 375,13758 by 16,7324 and let there be only one Place of Decimals. *Facit* 6276,9
5. Multiply 375,13758 by 16,7324 and leave only 4 Places of Decimals. *Facit* 6276,9520
6. Multiply 395,3756 by ,75642 and let there be only 4 Places of Decimals. *Facit* 299,0699

DIVI.

DIVISION of DECIMALS.

THIS Rule is also worked as in whole Numbers, the only Difficulty is in valuing the Quotient, which is done by either of the following general Rules.

RULE 1. The first Figure in the Quotient is always of the same Value with that Figure of the Dividend, which answers or stands over the Place of Units in the Divisor.

2. The Quotient must always have so many Decimal Places, as the Dividend has more than the Divisor.

NOTE, If the Divisor and Dividend have both the same Number of Decimal Parts, the Quotient will be all a whole Number.

2. If the Dividend hath not so many Places of Decimals as are in the Divisor, then so many Cyphers must be annexed to the Dividend, as will make them equal, and the Quotient will then be all an whole Number.

3. But if when the Division is done, the Quotient has not so many Figures as it should have Places of Decimals, then so many Cypher. must be prefixed as there are Places wanting.

EXAMPLES.

1. Divide 85643,825 by 6,321 Facit 13549.

- | | |
|-------------------------|------------------------------|
| 2. Divide 48 by 144 | 7. Divide 7382,54 by 6,4352 |
| 3. Divide 217,75 by 65 | 8. Divide ,08516438 by 423 |
| 4. Divide ,125 by ,1045 | 9. Divide 267,15975 by 13,25 |
| 5. Divide ,709 by 2,574 | 10. Divide 72,1564 by ,1347 |
| 6. Divide 5,714 by 8725 | 11. Divide 715 by ,3075 |

When Numbers are to be divided by 10, 100, 1000, 10000, &c. it is performed, by placing the separating Point in the Dividend so many Places towards the Left Hand, as there are Cyphers in the Divisor.

$$\begin{array}{l} \text{thus } 5784 \div 10 = 578,4 \\ 5784 \div 100 = 57,84 \end{array} \quad \begin{array}{l} 4784 \div 1000 = 4,784 \\ 4784 \div 10000 = ,4784 \end{array}$$

Contracted DIVISION of DECIMALS.

RULE. **B**Y the first Rule, find what is the Value of the first Figure in the Quotient, then by knowing the first Figure's Denomination, the Decimal Places may be reduced to any Number, by taking as many of the left Hand Figures of the Dividend as will answer them: And in dividing, omit one Figure of the Divisor at each following Operation.

Note, That in multiplying every Figure left out in the Divisor, you must carry 1, if it be 5, or upwards, to 15; if 15, or upwards, to 25 carry 2, if 25, or upwards, to 35 carry 3, &c.

EXAMPLES.

1. Divide 721,17562 by 2,257432, add let there be only three Places of Decimals in the Quotient.

<i>Contracted.</i>	<i>Common Way.</i>
$ \begin{array}{r} 2,257432 \overline{) 721.17562(319,467} \\ \underline{\dots\dots 6772296} \\ 439460. \\ \underline{225743.} \\ 213717.. \\ \underline{203169..} \\ 10548... \\ \underline{\cdot 9030...} \\ 1518.... \\ \underline{1354....} \\ 164..... \\ \underline{158.....} \\ \cdot 6 \end{array} $	$ \begin{array}{r} 2,257432 \overline{) 721.17562(319,467} \\ \underline{6772296} \\ 439460 \quad 2 \\ \underline{225743 \quad 2} \\ 213717 \quad 00 \\ \underline{203168 \quad 88} \\ 10548 \quad 120 \\ \underline{\cdot 9029 \quad 728} \\ 1518 \quad 3920 \\ \underline{1354 \quad 4592} \\ 163 \quad 93280 \\ \underline{158 \quad 02024} \\ ..591256 \end{array} $

2. Divide 8,758615 by 5,2714167
3. Divide 5171,591 by 8,7586
4. Divide 25,1367 by 217,35
5. Divide 514,7549 by ,123425
6. Divide 70,23 - by 7,9863
7. Divide 27,104 - by 3,712

REDUCTION of DECIMALS.

To reduce a Vulgar Fraction to a Decimal.

RULE. **A**DD Cyphers to the Numerator, and divide by the Denominator, the Quotient is the Decimal Fraction required.

EXAMPLES.

1. Reduce $\frac{1}{4}$ - - - to a Decimal. 4)1,00(,25 Facit.
2. Reduce $\frac{1}{2}$ - - - to a Decimal. Facit ,5
3. Reduce $\frac{3}{4}$ - - - to a Decimal. Facit ,75
4. Reduce $\frac{3}{8}$ - - - to a Decimal. Facit ,375
5. Reduce $\frac{5}{8}$ - - - to a Decimal. Facit ,625
6. Reduce $\frac{1}{4}$ of $\frac{10}{13}$ to a Decimal. Facit ,6043956+

Note, If the given Parts are of several Denominations, they may be reduced either by so many distinct Operations, as there are different Parts, or by first reducing them into their lowest Denomination, and then divide as before; or,

2dly, Bring the lowest into Decimals of the next superior Denomination, and on the right Hand of the Decimal found, place the Parts given of the next superior Denomination, so proceeding till you bring out the Decimal Parts of the highest Integer required, by still dividing the Product by the next superior Denominator; or,

3dly, To reduce Shillings, Pence, and Farthings; if the Number of Shillings be even, take the Half for the first Place of Decimals, and let the second and third Places be filled up with the Farthings contained in the remaining Pence and Farthings, always remembering to add 1, when it is or exceeds 25: But if the Number of Shillings be odd, the second Place of Decimals must be increased by 5.

7. Reduce 5 s. to the Decimal of a l. Facit ,25

8. Reduce 9 s. to the Decimal of a l. Facit ,45

9. Reduce 16 s. to the Decimal of a l. Facit ,8

10. Reduce

116 Reduction of Decimals.

The Tutor's

10. Reduce 8 s. 4 d. to the Decimal of a l. *Facit* 416.
 11. Reduce 16 s. 7 d $\frac{3}{4}$ to the Decimal of a l. *Facit*
 8322916

<i>first.</i>	<i>second.</i>	<i>third.</i>	
16 s. 7 d. $\frac{3}{4}$.	4)3,00	2)16	7 $\frac{1}{2}$
12	<u> </u>	<u> </u>	4
—	12)7,75	,832	—
199	<u> </u>		32
4	2 0)16,64583		
<u> </u>	<u> </u>		
960)799,8322916	,8322916		

12. Reduce 19 s. 5 d. $\frac{1}{2}$ to the Decimal of a l. *Facit*
 ,972916
 13. Reduce 12 Grains to the Decimal of a lb. Troy.
Facit ,002083
 14. Reduce 12 Drams to the Decimal of a lb. Avoir-
 dupoise. *Facit* ,046875
 15. Reduce 2 Quarters, 14 lb. to the Decimal of an
 cwt. *Facit* ,625
 16. Reduce 2 Furlongs to the Decimal of a League.
Facit ,083
 17. Reduce 2 quarts 1 Pint to the Decimal of a Gallon.
Facit ,625
 18. Reduce 4 Gallons, 2 Quarts of Wine to the Deci-
 mal of a Hoghead. *Facit* ,071428 +
 19. Reduce 2 Gallons, 1 Quart of Beer to the Deci-
 mal of a Barrel. *Facit* ,0625
 20. Reduce 52 Days to the Decimal of a Year. *Facit*
 ,142465 +

To find the Value of any Decimal Fraction in the known Parts of an Integer.

RULE. Multiply the Decimal given by the Number of Parts of the next inferior Denomination, cutting off the Decimals from the Product; then multiply the Remainder by the next inferior Denomination, thus proceeding till you have brought it in the least known Parts of an Integer,

EXAMPLES.

1. What is the Value of ,8322916 of a l. *Ans.* 16 s. 7 d. $\frac{1}{2}$ +

$$\begin{array}{r}
 20 \\
 \hline
 16,6458320 \\
 12 \\
 \hline
 7,7499840 \\
 4 \\
 \hline
 \frac{1}{2},9999360
 \end{array}$$

2. What is the Value of ,002084 of a lb. Troy ?
Answer, 12,00384 qrs.
3. What is the Value of ,046875 of a lb Avoirdupoise ?
Answer, 12 drams.
4. What is the Value of ,625 of an cwt.? *Answer,*
 2 qrs. 14 lb.
5. What is the Value of ,625 of a Gallon? *Answer,*
 2 quarts 1 pint.
6. What is the Value of ,071428 of a Hoghead of Wine? *Answer,* 4 gall. 1 quart, 999856.
7. What is the Value of ,0625 of a Barrel of Beer?
Answer, 2 gall. 1 quart.
8. What is the Value of ,142465 of a Year?
Answer, 51,999725 days.

Decimal TABLES of COIN, WEIGHT and MEASURE.

TABLE I.
ENGLISH COIN.
1 L. the Integer.

<i>Sb.</i>	<i>dec.</i>	<i>Sb.</i>	<i>dec.</i>
19	,95	9	,45
18	,9	8	,4
17	,85	7	,35
16	,8	6	,3
15	,75	5	,25
14	,7	4	,2
13	,65	3	,15
12	,6	2	,1
11	,55	1	,05
10	,5		

<i>Pence.</i>	<i>Decimals.</i>
6	,025
5	,020833
4	,016666
3	,0125
2	,008333
1	,004166

<i>Farth.</i>	<i>Decimals.</i>
3	,003125
2	,0020833
1	,0010416

TABLE II.
ENG. COIN. 1 *Sb.*
Long Mea. 1 *Foot.*
The Integer.

<i>Pence and Inches.</i>	<i>Decimals.</i>
6	,5
5	,416666
4	,333333
3	,25
2	,166666
1	,083333

<i>Farth.</i>	<i>Decimals.</i>
3	,0625
2	,041666
1	,020833

TABLE III.
TROY WEIGHT.
1 lb. the Integer.

Ounces the same as Pence in the last Table.

<i>Penny-weight.</i>	<i>Decimals.</i>
10	,041666
9	,0375
8	,033333
7	,029166
6	,025
5	,020833
4	,016666
3	,0125
2	,008333
1	,004166

<i>Grains.</i>	<i>Decimals.</i>
12	,002083
11	,001910
10	,001736
9	,001562
8	,001389
7	,001215
6	,001042
5	,000868
4	,000694
3	,000521
2	,000347
1	,000173

1 Oz. the Integer.
Pennywt. the same as Sb. in the first Table.

<i>Grains.</i>	<i>Decimals.</i>
12	,025
11	,022916
10	,020833
9	,01875
8	,016666
7	,014583
6	,0125
5	,010416
4	,008333
3	,00625
2	,004166
1	,002083

TABLE IV.
A VOIRDUP. WT.
112 lb. the Integer.

<i>Qrs.</i>	<i>Decimals.</i>
3	,75
2	,5
1	,25

<i>Pounds.</i>	<i>Decimals.</i>
14	,125
13	,116071
12	,107143
11	,098214
10	,089286
9	,080357
8	,071428
7	,0625
6	,053571
5	,044643
4	,035714
3	,026786
2	,017857
1	,008928

<i>Ounces.</i>	<i>Decimals.</i>
8	,004464
7	,003906

Decimal TABLES of COIN, WRIGHT and MEASURE.

6	,003348
5	,002790
4	,002232
3	,001674
2	,001116
1	,000558

$\frac{1}{4}$ Oz.	Decimals.
3	,000418
2	,000279
1	,000139

TABLE V.
AVOIRDUP. WT.
1 lb. the Integer.

Ounces	Decimals.
8	,5
7	,4375
6	,375
5	,3125
4	,25
3	,1875
2	,115
1	,0625

Drams.	Decimals.
8	,03125
7	,027343
6	,023437
5	,019531
4	,015625
3	,011718
2	,007812
1	,003906

TABLE VI.
LIQUID MEAS.
1 Tun the Integer.

Gallons.	Decimals.
100	,396825
90	,357141

80	,317460
70	,27
60	,238095
50	,198412
40	,158730
30	,119047
20	,079365
10	,039682
9	,035714
8	,031746
7	,027
6	,023809
5	,019841
4	,015873
3	,011904
2	,007936
1	,003968

Pints.	Decimals.
4	,001984
3	,001488
2	,000992
1	,000496

A Hogfhead the Integer.

Gallons.	Decimals.
30	,476190
20	,317460
10	,158730
9	,142857
8	,126984
7	,111111
6	,095238
5	,079365
4	,063492
3	,047619
2	,031746
1	,015873

Pints.	Decimals.
3	,005952
2	,003968
1	,001684

TABLE VII.
MEASURE.
Liquid. Dry.
1 Gallon. 1 Quarter.
Integer.

Pints.	Decim.	Busb.
4	,5	4
3	,375	3
2	,25	2
1	,125	1

Q.pt.	Decim.	Peck.
3	,09375	3
2	,0625	2
1	,03125	1

Decimals.	Q. pks.
,0234375	3
,015625	2
,0078125	1

Decimals.	Pints.
,005859	3
,003906	2
,001953	1

TABLE VIII.
LONG MEASURE.
1 Mile the Integer.

Yards.	Decimals.
1000	,568182
900	,511364
800	,454545
700	,397727
600	,340909

Decimal TABLES of COIN, WEIGHT, and MEASURE.

500	,284091
400	,227272
300	,170454
200	,113636
100	,056818
90	,051136
80	,045454
70	,039773
60	,034091
50	,028409
40	,022727
30	,017045
20	,011364
10	,005682
9	,005114
8	,004545
7	,003977
6	,003409
5	,002841
4	,002273
3	,001704
2	,001139
1	,000568

Feet.	Decimals.
2	,0003787
1	,0001894

Inch.	Decimals.
6	,0000947
3	,0000474
1	,0000158

TABLE IX.

TIME.

1 Year the Integ.
Months the same as
Pence, in the se-
cond Table.

Days.	Decimals.
365	1,000000
300	,821918
200	,547945
100	,273973
90	,246575

80	,219178
70	,191781
60	,164383
50	,136986
40	,109589
30	,082192
20	,054794
10	,027397
9	,024657
8	,021918
7	,019178
6	,016438
5	,013698
4	,010959
3	,008219
2	,005479
1	,002739

1 Day the Integer

Hours.	Decimals.
12	,5
11	,458333
10	,416666
9	,375
8	,333333
7	,291666
6	,25
5	,208333
4	,166666
3	,125
2	,083333
1	,041666

Minu.	Decimals.
30	,020833
20	,013888
10	,006944
9	,00625
8	,005555
7	,004861
6	,004166
5	,003472
4	,002777
3	,002083

2	,001388
1	,000694

TABLE X.

CLOTH MEASURE.

1 Yard the Integer.

Qrs. the same as
Table 4.

Nails.	Decimals.
2	,125
1	,0625

TABLE XI.

LEAD WEIGHT.

A Fother the Inte.

Hund.	Decimals.
10	,512820
9	,461538
8	,410256
7	,358974
6	,307692
5	,256410
4	,205128
3	,153846
2	,102564
1	,051282

Qrs.	Decimals.
2	,025641
1	,012820

Pounds.	Decimals.
14	,0064102
13	,0059523
12	,0054945
11	,0050366
10	,0045787
9	,0041208
8	,0036630
7	,0032051
6	,0027472
5	,0022893
4	,0018315
3	,0013736
2	,0009157
1	,0004578

The RULE of THREE in DECIMALS.

EXAMPLES.

1. IF 26 $\frac{1}{2}$ Yards cost 3*l.* 16*s.* 3*d.* what will 32 Yards and a Quarter come to?

Yds.	1.	Yds.
26,5	: 3,8125	: : 32,25
	32,25	

26,5)122,953125(4,63974=4*l.* 12*s.* 9*d.* $\frac{1}{2}$.

2. What will the Pay of 540 Men come to at 1*l.* 5*s.* 6*d.* per Man? *Answer*, 688*l.* 10*s.*

3. If 7 Yards, 3 Quarters of Cloth cost 2*l.* 12*s.* 9*d.* what will 140 Yards one Half, of the same Cloth cost? *Answer*, 47*l.* 16*s.* 3*d.* 2,4 *qrs.*

4. If a Chest of Sugar, weighing 7 *cwt.* 2 *qrs.* 14 *lb.* cost 36*l.* 12*s.* 9*d.* what will 2 *cwt.* 1 *qr.* 21 *lb.* of the same Sugar cost? *Answer*, 11*l.* 14*s.* 2*d.* 3,5 *qrs.*

5. A Grocer buys 24 *Tun*, 12 *cwt.* 2 *qrs.* 14 *lb.* 12 *oz.* of Tobacco for 3678*l.* 6*s.* 4*d.* what will 1 *oz.* come to? *Answer*, 1*d.*

6. What will 326 *lb.* one Quarter of Tobacco come to, when 1 *lb.* $\frac{1}{4}$ is sold for 3*s.* 6*d.*? *Answer*, 38*l.* 1*s.* 3*d.*

7. What is the Worth of 19 *oz.* 3 *dwt.* 5 *gr.* of Gold, at 2*l.* 19*s.* per *oz.*? *Answer*, 56*l.* 10*s.* 5*d.* 2,9981 *qrs.*

8. What is the Worth of 827 Yards, 3 Quarters, of Painting, at 10*d.* $\frac{1}{4}$ per Yard? *Ans.* 36*l.* 4*s.* 3*d.* 1,5 *qr.*

9. If I lent my Friend 34*l.* for $\frac{1}{4}$ of a Year, how much ought he to lend me $\frac{1}{12}$ of a Year to requite my Kindness? *Answer*, 51*l.*

10. If $\frac{1}{4}$ of a Yard of Cloth, that is, 2 Yards one Quarter broad make a Garment, how much that is $\frac{1}{4}$ of a Yardwide will make the same? *Answer*, 2,109375 Yards.

11. If 1 Ounce of Silver cost 5*s.* 6*d.* what is the Price of a Tankard that weighs 1*lb.* 10 *oz.* 10 *dwt.* 4 *grains*? *Answer*, 6*l.* 3*s.* 9*d.* 2,2 *grains.*

12. If 1*lb.* of Tobacco cost 15*d.* what cost 3 Hogf-heads, weighing together 15 *cwt.* 1 *qr.* 19 *lb.*? *Answer*, 107*l.* 18*s.* 9*d.*

122 *Extraction of the Square Root.* The TUTOR'S

13. If 1 *cwt.* of Currants cost 2 *l.* 9 *s.* 6 *d.* what will 45 *cwt.* 3 *qrs.* 14 *lb.* cost at the same Rate? *Answer,* 113 *l.* 10 *s.* 9 *d.* 3 *qrs.*

14. Bought 6 Chests of Sugar, each 6 *cwt.* 3 *qrs.* at 2 *l.* 16 *s.* per *cwt.* what do they come to? *Answer,* 113 *l.* 8 *s.*

15. Bought a Tankard for 10 *l.* 12 *s.* at the Rate of 5 *s.* 4 *d.* per Ounce, what was the Weight? *Answer,* 39 *oz.* 15 *dwt.*

16. Gave 187 *l.* 3 *s.* 3 *d.* for 25 *cwt.* 3 *qrs.* 14 *lb.* of Tobacco, at what Rate did I buy it at per *lb.*? *Answer,* 15 *d.* 2 *qrs.*

17. Bought 29 *lb.* 4 *oz.* of Coffee for 10 *l.* 11 *s.* 3 *d.* what is the Value of 3 *lb.*? *Answer,* 1 *l.* 1 *s.* 8 *d.*

18. If I gave 1 *s.* 1 *d.* for 3 *lb.* $\frac{1}{2}$ of Cheese, what will be the Value of 1 *cwt.*? *Answer,* 1 *l.* 14 *s.* 8 *d.*

EXTRACTION of the SQUARE ROOT.

EXtracting the Square Root is to find out such a Number as being multiplied into itself, the Product will be equal to the given Number.

RULE. First, Point the given Number, beginning at the Unit's Place, then to the Hundreds, and so upon every Second Figure throughout.

Secondly, Seek the greatest Square Number in the first Point, towards the Left Hand, placing the Square Number under the first Point, and the Root thereof in the Quotient; subtract the Square Number from the first Point, and to the Remainder bring down the next Point, and call that the Resolvend.

Thirdly, Double the Quotient, and Place it for a Divisor on the left Hand of the Resolvend; seek how often the Divisor is contained in the Resolvend (reserving always the Unit's Place) and put the Answer in the Quotient, and also on the right Hand Side of the Divisor; then multiply by the Figure last put in the Quotient, and subtract the Product from the Resolvend, bring down the next Point to the Remainder (if there be any more) and proceed as before.

Roots.	1.	2.	3.	4.	5.	6.	7.	8.	9.
Squares.	1.	4.	9.	16.	25.	36.	49.	64.	81.

EXAM-

ASSISTANT. *Extraction of the Square Root.* 123

EXAMPLES.

1. What is the Square Root of 119025? *Answer, 345.*

$$\begin{array}{r}
 119025(345 \\
 \underline{9} \\
 64)290 \\
 \underline{256} \\
 685)3425 \\
 \underline{3425}
 \end{array}$$

2. What is the Square Root of 106929? *Ans. 327*
 3. What is the Square Root of 2268741? *Ans. 1506,23+*
 4. What is the Square Root of 7596796? *Ans. 2756,228+*
 5. What is the Square Root of 36372961? *Ans. 6031*
 6. What is the Square Root of 22071204? *Ans. 4698*

When the given Number consists of a whole Number, and Decimals together, make the Number of Decimals even, by adding Cyphers to them, so that there may be a Point fall on the Unit's Place of the whole Number.

7. What is the Square Root of 3271,4007? *Ans. 57,15+*
 8. What is the Square Root of 4795,25731? *Ans. 69,247+*
 9. What is the Square Root of 4,372594? *Ans. 2,091+*
 10. What is the Square Root of 2,2710957? *Ans. 1,50701+*
 11. What is the Square Root of ,00032754? *Ans. ,01809+*
 12. What is the Square Root of 1,270054? *Ans. 1,1269+*

To extract the Square Root of a VULGAR FRACTION.

RULE. Reduce the Fraction to its lowest Terms, then extract the Square Root of the Numerator for a new Numerator, and the Square Root of the Denominator for a new Denominator.

If the Fraction be a Surd, (i. e.) a Number where a Root can never be exactly found, reduce it to a Decimal, and extract the Root from it.

EXAMPLES.

13. What is the Square Root of $\frac{2104}{144}$? *Answer, $\frac{2}{3}$.*
 14. What is the Square Root of $\frac{2704}{4225}$? *Answer, $\frac{2}{5}$.*
 15. What is the Square Root of $\frac{9216}{12544}$? *Answer, $\frac{3}{7}$.*

124 Extraction of the Square Root. The TUTOR's

S U R D S.

16. What is the Square Root of $\frac{275}{341}$? *Ans.* ,89802+
 17. What is the Square Root of $\frac{552}{476}$? *Ans.* ,86602+
 18. What is the Square Root of $\frac{478}{343}$? *Ans.* ,93308+

To extract the Square Root of a MIXED NUMBER.

RULE. Reduce the Fractional Part of the mixed Number to its lowest Term, and then the mixed Number to an improper Fraction.

2dly. Extract the Roots of the Numerator and Denominator for a new Numerator and Denominator.

If the mixed Number given be a Surd, reduce the Fractional Part to a Decimal, annex it to the whole Number, and extract the Square Root therefrom.

EXAMPLES.

19. What is the Square Root of $51\frac{21}{33}$? *Ans.* $7\frac{1}{2}$.
 20. What is the Square Root of $27\frac{9}{16}$? *Ans.* $5\frac{1}{4}$.
 21. What is the Square Root of $5\frac{43}{49}$? *Ans.* $3\frac{1}{7}$.

S U R D S.

22. What is the Square Root of $85\frac{14}{13}$? *Ans.* 9,27+
 23. What is the Square Root of $8\frac{7}{7}$? *Ans.* 2,9519+
 24. What is the Square Root of $6\frac{3}{3}$? *Ans.* 2,5298+

The APPLICATION.

1. There is an Army consisting of a certain Number of Men, who are placed Rank and File, that is, in the Form of a Square, each Side having 576 Men, I desire to know how many the whole Square contains? *Ans.* 331776.

2. A certain Pavement is made exactly square, each Side of which contains 97 Feet, I demand how many square Feet are contained therein? *Answer,* 9409.

To find a mean Proportional between any two given Numbers.

RULE. The Square Root of the Product of the given Numbers is the mean Proportional sought.

E X A M -

ASSISTANT. *Extraction of the Square Root.* 125

EXAMPLES.

1. What is the mean Proportional between 3 and 12?
Ans. $3 \times 12 = 36$ then $\sqrt{36} = 6$ the mean Proportion.

2. What is the mean Proportional between 4276, and 842? *Ans.* 1897,4 +

To find the Side of a Square equal in Area to any given Superficies.

RULE. The Square Root of the Content of any given Superficies, is the Square equal sought.

EXAMPLES.

3. If the Content of a given Circle be 160, what is the Side of the Square equal? *Ans.* 12,64911.

4. If the Area of a Circle is 750, what is the Side of the Square equal? *Ans.* 27,38612.

The Area of a Circle given to find the Diameter.

RULE. As 355 : 452, or as 1 : 1.273239 :: so is the Area : to the Square of the Diameter; — or, multiply the square Root of the Area, by 1,12837, and the Product will be the Diameter.

EXAMPLE.

5. What Length of Cord will fit to tie to a Cow's Tail, the other End fixed in the Ground, to let her have Liberty of eating an Acre of Grass, and no more, supposing the Cow and Tail to be 5 Yards and a Half. *Ans.* 6,136 Perches.

The Area of a Circle given to find the Periphery, or Circumference.

RULE. As 113 : 1420, or, as 1 : 12,56637 :: the Area : to the Square of the Periphery, or multiply the Square Root of the Area by 3,5449, and the Product is the Circumference.

EXAMPLES.

6. When the Area is 12, what is the Circumference? *Ans.* 12,2798.

7. When the Area is 160, what is the Periphery? *Ans.* 44,84.

Any two Sides of a right angled Triangle given to find the third Side.

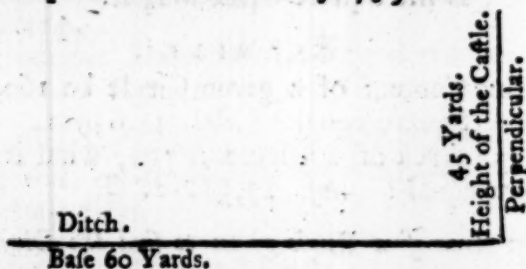
126 *Extraction of the Square Root.* The TUTOR'S

1. *The Base and Perpendicular given to find the Hypotenuse.*

RULE. The Square Root of the Sum of the Squares of the Base and Perpendicular is the Length of the Hypotenuse.

EXAMPLES.

8. The Top of a Castle from the Ground is 45 Yards high, and is surrounded with a Ditch 60 Yards broad, what Length must a Ladder be to reach from the Outside of the Ditch to the Top of the Castle? *Ans.* 75 yards.



9. The Wall of a Town is 25 Feet high, which is surrounded by a Moat of 30 Feet in Breadth, I desire to know the Length of a Ladder that will reach from the Outside of the Moat to the Top of the Wall? *Ans.* 39,05 Feet.

The Hypotenuse and Perpendicular given to find the Base.

RULE. The Square Root of the Difference of the Squares of the Hypotenuse and Perpendicular, is the Length of the Base.

The Base and Hypotenuse given to find the Perpendicular.

RULE. The Square Root of the Difference of the Squares of the Hypotenuse and Base is the Height of the Perpendicular.

N. B. *The two last Questions may be varied for Examples to the two last Propositions.*

Any Number of Men being given to form them into a square Battle, or to find the Number of Ranks and Files.

RULE. The Square Root of the Number of Men given, is the Number of Men either in Rank or File.

10. An Army consisting of 331776 Men, I desire to know how many in Rank and File? *Answer,* 576.

11. A certain square Pavement contains 48841 square Stones, all of the same Size, I demand how many are contained in one of the Sides? *Answer,* 221.

E X.

EXTRACTION of the CUBE ROOT.

TO extract the Cube Root is to find out a Number which being multiplied into itself, and then into that Product, produceth the given Number.

RULE 1. Point every third Figure of the Cube given, beginning at the Unit's Place, seek the greatest Cube to the first Point and subtract it therefrom, put the Root in the Quotient, and bring down the Figures in the next Point to the Remainder for a *Resolvend*.

2. Find a **DIVISOR** by multiplying the Square of the Quotient by 3. See how often it is contained in the *Resolvend*, rejecting the Units and Tens, and put the Answer in the Quotient.

3. To find the **SUBTRAHEND**. 1. Cube the last Figure in the Quotient. 2. Multiply all the Figures in the Quotient by 3, except the last, and that Product by the Square of the last. 3. Multiply the Divisor by the last Figure. Add these Products together, gives the Subtrahend, which subtract from the *Resolvend*; to the Remainder bring down the next Point and proceed as before.

ROOTS.	1.	2.	3.	4.	5.	6.	7.	8.	9.
CUBES.	1.	8.	27.	64.	125.	216.	343.	513.	729.

EXAMPLES.

1. What is the Cube Root of 99252847?

$$\begin{array}{r} 99252847(463 \\ 64 = \text{Cube of } 4. \end{array}$$

Divisor.

Square of $4 \times 3 = 48$) 35252 *Resolvend*.

$$216 = \text{Cube of } 6.$$

$$432 = 4 \times 3 \times \text{by Square of } 6.$$

$$288 = \text{Divisor} \times \text{by } 6.$$

$$33336 \text{ Subtrahend.}$$

Divisor.

Square of $46 \times 3 = 6348$) 1916847 *Resolvend*.

$$27 = \text{Cube of } 3.$$

$$1242 = 46 \times 3 \times \text{by Square of } 3.$$

$$19044 = \text{Divisor} \times \text{by } 3.$$

$$1916847 \text{ Subtrahend.}$$

Another

128 Extraction of the Cube Root. The Tutor's

Another New and more concise Method of extracting the Cube Root.

RULE 1. Point every third Figure of the Cube given, beginning at the Unit's Place, then find the highest Cube to the first Point, and subtract it therefrom, put the Root in the Quotient, bring down the Figures in the next point to the remainder for a Resolvend.

2. Square the Quotient and triple the Square for a Divisor, As $4 \times 4 \times 3 = 48$. Find how often it is contained in the Resolvend, rejecting Units and Tens, and put the Answer in the Quotient.

3. Square the last Figure in the Quotient, and put it on the right Hand of the Divisor :

As $6 \times 6 = 36$ put to the Divisor $48 = 4836$.

4. Triple the last Figure in the Quotient and multiply by the former, put it under the other, Units under the Tens, add them together, and multiply the Sum by the last Figure in the Quotient, subtract that Product from the Resolvend, bring down the next Point and proceed as before.

EXAMPLES.

What is the Cube Root of 99252847?

Square of $4 \times 3 = 48$ Divisor.	99252847(463
Square of 6, put to $48 = 4836$	64
$6 \times 3 \times 4 = 72$	
	35252
$5556 \times 6 = 33336$	
Square of 46 = $2116 \times 3 = 6348$ Divisor	1916847
Square of 3 = 9 put to 6348 = 634809	
$3 \times 3 \times 46 = 414$	
	638949 $\times 3 = 1916847$

2. What is the Cube Root of 389017? - Answer, 73.
3. What is the Cube Root of 5735339? - Answer, 179.
4. What is the Cube Root of 32461759? Answer, 319.
5. What is the Cube Root of 84604519? Answer, 439.
6. What is the Cube Root of 259694072? Answer, 638.
7. What is the Cube Root of 48228544? Answer, 364.
8. What

* When the Quotient is 3 or 2 there must be a Cypher put to supply the Place of Tens.

ASSISTANT. *Extraction of the Cube Root.* 129

8. What is the Cube Root of 27054036008? *Ans.* 3002.
9. What is the Cube Root of 22069810125? *Ans.* 2805.
10. What is the Cube Root of 122615327232? *Ans.* 4968.
11. What is the Cube Root of 219365327791? *Ans.* 6031.
12. What is the Cube Root of 673373097125? *Ans.* 8765.

1. *When the given Number consists of a whole Number and Decimal together, make the Number of Decimals to consist of 3, 6, 9, &c. Places, by adding Cyphers thereto, so that there may be a Point fall on the Unit's Place of the whole Number.*

13. What is the Cube Root of 12,977875? - *Ans.* 2,35
14. What is the Cube Root of 36155,027576? *Ans.* 33,06 +
15. What is the Cube Root of ,001906624? - *Ans.* ,124
16. What is the Cube Root of 33,230979637? *Ans.* 3,215 +
17. What is the Cube Root of 15926,972504? *Ans.* 25,19 +
18. What is the Cube Root of ,053258279? - *Ans.* ,376 +

To extract the Cube Root of a Vulgar Fraction.

RULE. Reduce the Fraction to its lowest Terms, then extract the Cube Root of the Numerator and Denominator for a new Numerator and Denominator, but if the Fraction be a Surd, reduce it to a Decimal, and then extract the Root from it.

EXAMPLES.

19. What is the Cube Root of $\frac{216}{8}$? *Answer,* $\frac{6}{2}$.
20. What is the Cube Root of $\frac{324}{125}$? *Answer,* $\frac{6}{5}$.
21. What is the Cube Root of $\frac{1}{\frac{1}{2} \frac{20}{30}}$? *Answer,* $\frac{1}{\frac{1}{2} \frac{20}{30}}$.

SURDS.

22. What is the Cube Root of $\frac{4}{7}$? *Answer,* ,829 +
23. What is the Cube Root of $\frac{5}{9}$? *Answer,* ,822 +
24. What is the Cube Root of $\frac{2}{3}$? *Answer,* ,873 +

To extract the Cube Root of a mixt Number.

RULE. Reduce the fractional Part to its lowest Terms, and then the mixt Number to an improper Fraction, extract the Cube Roots of the Numerator and Denominator for a new Numerator and Denominator; but if the mixt Number given be a Surd, reduce the fractional Part to a Decimal, annex it to the whole Number, and extract the Root therefrom.

EXAMPLES.

25. What is the Cube Root of $12 \frac{12}{27}$? - *Answer,* $2 \frac{1}{3}$.
26. What is the Cube Root of $31 \frac{12}{27}$? *Answer,* $3 \frac{1}{3}$.
27. What is the Cube Root of $405 \frac{28}{125}$? *Answer,* $7 \frac{2}{5}$.

SURDS.

S U R D S.

28. What is the Cube Root of $7\frac{1}{2}$? *Ans.* 1,93+
 29. What is the Cube Root of $9\frac{1}{8}$? *Ans.* 2,092+
 30. What is the Cube Root of $8\frac{1}{4}$? *Ans.* 2,057+

The APPLICATION.

1. If a cubical Piece of Timber be 47 Inches long, 47 Inches broad, and 47 Inches deep, how many cubical Inches doth it contain? *Ans.* 103823.
 2. There is a Cellar dug, that is 12 Feet every Way in Length, Breadth, and Depth, how many solid Feet of Earth was taken out of it? *Ans.* 1728.
 3. There is a Stone of a Cubic Form, which contains 389017 solid Feet, what is the superficial Content of one of its Sides? *Ans.* 5329.

Between two Numbers given, to find two mean Proportionals.

RULE. Divide the greater Extream by the lesser, and the Cube Root of the Quotient multiplied by the lesser Extream, gives the lesser Mean; multiply the said Cube Root by the lesser mean, and the Product will be the greater Mean proportional.

E X A M P L E S.

4. What are the two mean Proportionals between 6 and 162? *Ans.* 18 and 54.
 5. What are the two mean Proportionals between 4 and 308? *Ans.* 12 and 36.

To find the Side of a Cube that shall be equal in Solidity to any given Solid, as a Globe, Cylinder, Prism, Cone, &c.

RULE. The Cube Root of the solid Content of any solid Body given, is the Side of the Cube of equal Solidity.

E X A M P L E.

6. If the solid Content of a Globe is 10648 what is the Side of a Cube of equal Solidity? *Ans.* 22.

The Side of the Cube being given, to find the Side of that Cube, that shall be double, treble, &c. in Quantity to the given Cube.

RULE. Cube the Side given, and multiply it by 2, 3, &c. the Cube Root of the Product is the Side sought.

E X A M P L E.

7. There is a cubical Vessel, whose Side is 12 Inches, and it is required to find the Side of another Vessel, that is to contain 3 Times as much? *Ans.* 17,306.

E X-

EXTRACTION of the BIQUADRATE ROOT.

TO extract the Biquadrate Root, is to find out a Number, which being involved four Times into itself will produce the given Number.

RULE. First extract the Square root of the given Number, and then extract the Square Root of that Square Root, and it will give the Biquadrate Root required.

EXAMPLES.

1. What is the Biquadrate of 27? — — — *Ans.* 531441.
2. What is the Biquadrate of 76? — — — *Ans.* 33362176.
3. What is the Biquadrate of 275? — — — *Ans.* 5719140625.
4. What is the Biquadrate Root of 531441? — — — *Ans.* 27.
5. What is the Biquadrate Root of 33362176? — — — *Ans.* 76.
6. What is the Biquadrate Root of 5719140625? — — — *Ans.* 275.

A general RULE for EXTRACTING the ROOTS of all POWERS.

1. **P**REPARE the Number given for Extraction, by pointing off from the Units Place, as the Root required directs.
2. Find the first Figure in the Root; by the Table of Powers, which subtract from the given Number.
3. Bring down the first Figure in the next Point to the Remainder, and call it the Dividend.
4. Involve the Root into the next inferior Power to that which is given, multiply it by the given Power, and call it the Divisor.
5. Find a Quotient Figure by common Division, and annex it to the Root, then involve the whole Root into the given Power, and call that the Subtrahend.
6. Subtract that Number from as many Points of the given Power as is brought down, beginning at the lowest Place, and to the Remainder bring down the first Figure of the next Point for a new Dividend.
7. Find a new Divisor, and proceed in all Respects as before.

EXAM-

132 Extracting the Roots of Powers. The Tutor's

EXAMPLES.

1. What is the square Root of 141376?

$$\begin{array}{r} \cdot\cdot\cdot\cdot \\ 141376(379 \\ \underline{9} \end{array}$$

6)51 Dividend

1369 Subtrahend

74) 447 Dividend

141376 Subtrahend

$3 \times 2 = 6$ Divisor

$37 \times 37 = 1369$ Subtrahend

$37 \times 2 = 74$ Divisor

$376 \times 376 = 141376$ Subtrahend

2. What is the Cube Root of 53157376?

$$\begin{array}{r} \cdot\cdot\cdot\cdot \\ 53157376(376 \\ \underline{27} \end{array}$$

27)261 Dividend

50653 Subtrahend

4107)25043 Dividend

53157376 Subtrahend

$3 \times 3 \times 3 = 27$ Divisor

$37 \times 37 \times 37 = 50653$ Subtrahend

$37 \times 37 \times 3 = 4107$ Divisor

$376 \times 376 \times 376 = 53157376$ Subtrahend.

3. What

3. What is the Biquadrate Root of 19987173376?

$$\begin{array}{r}
 19987173376(376 \\
 \underline{81} \\
 108)1188 \text{ Dividend} \\
 \underline{1874161} \text{ Subtrahend} \\
 202612)1245563 \text{ Dividend} \\
 \underline{19987173376} \text{ Subtrahend}
 \end{array}$$

$$\begin{aligned}
 3 \times 3 \times 3 \times 4 &= 108 \text{ Divisor} \\
 37 \times 37 \times 37 \times 37 &= 1874161 \text{ Subtrahend} \\
 37 \times 37 \times 37 \times 4 &= 202612 \text{ Divisor} \\
 376 \times 376 \times 376 \times 376 &= 19987173376 \text{ Subtrahend}
 \end{aligned}$$

SIMPLE INTEREST.

THERE are five Letters to be observed in Simple Interest, viz.

- P. the Principal.
- T. the Time.
- R. the Ratio, or Rate per Cent.
- I. the Interest.
- A. the Amount.

A TABLE of RATIOS.

3	,03	5½	,055	8	,08
3½	,035	6	,06	8½	,085
4	,04	6½	,065	9	,09
4½	,045	7	,07	9½	,095
5	,05	7½	,075	10	,1

NOTE. The Ratio is the Simple Interest of 1 l. for one Year, at the Rate per Cent. proposed, and is found thus:

$$\begin{array}{c}
 1. \quad 1. \quad 1. \\
 \text{As } 100 : 3 :: 1 : ,03 \quad \text{As } 100 : 3,5 :: 1 : ,035. \\
 \text{N} \qquad \qquad \qquad \text{When}
 \end{array}$$

134 Simple Interest.

The Tutor's

When the Principal, Time and Rate per Cent. are given to find the Interest.

RULE. Multiply the Principal, Time and Rate together, and it will give the Interest required.

Note, The Proposition and Rule are better expressed thus :

When P , T , and R are given to find I .

RULE. $prt = I$.

Note, When two or more Letters are put together like a Word they are to be multiplied one into another.

EXAMPLES.

1. What is the Interest of 945 l . 10 s . for 3 Years, at 5 per Cent. per Annum? *Ans.* $945,5 \times .05 \times 3 = 141,825$ or 141 l . 16 s . 6 d .

2. What is the Interest of 547 l . 14 s . at 4 per Cent. per Annum, for 6 Years? *Ans.* 131 l . 8 s . 11 d . 2 qr . 08.

3. What is the Interest of 796 l . 15 s . at $4\frac{1}{2}$ per Cent. per Annum for 5 Years? *Ans.* 179 l . 5 s . 4 d . 2 qr .

4. What is the Interest of 397 l . 9 s . 5 d . for 2 Years and $\frac{1}{2}$, at $3\frac{1}{2}$ per Cent. per Annum? *Ans.* 34 l . 15 s . 6 d . 3,5499 qrs .

5. What is the Interest of 554 l . 17 s . 6 d . for 3 Years, 8 Months. at $4\frac{1}{2}$ per Cent. per Annum? *Ans.* 91 l . 11 s . 1 d .

6. What is the Interest of 236 l . 18 s . 8 d . for 3 Years 8 Months, at $5\frac{1}{2}$ per Cent. per Ann.? *Ans.* 47 l . 15 s . 7 d . 1,4528 qrs .

When the Interest is for any Number of Days only.

RULE. Multiply the Interest of 1 l . for one Day, at the given Rate, by the Principal and Number of Days, it will give the Answer.

INTEREST of 1 l . for 1 DAY.

per Cent.	Decimals.	per Cent.	Decimals.
3	,00008219178	$6\frac{1}{2}$	,00017808219
$3\frac{1}{2}$	,00009589041	7	,00019178082
4	,00010958904	$7\frac{1}{2}$	,00020547945
$4\frac{1}{2}$	,00012328767	8	,00021917808
5	,00013698630	$8\frac{1}{2}$	,00023287671
$5\frac{1}{2}$	,00015068493	9	,00024657534
6	,00016438356	$9\frac{1}{2}$	,00026027397

Note, The above Table is thus found.

As. 365 : 03 :: 1 : ,00008219178. And as 365 : 035 :: 1 : ,00009589041, &c.

EXAM-

EXAMPLES.

1. What is the Interest of 240*l.* for 120 Days, at 4 per Cent. per Annum? *Ans.* ,00010958904 $\times$ 240 $\times$ 120 = 3*l.* 3*s.* 1*d.* $\frac{1}{4}$.
2. What is the Interest of 563*l.* at 6 per Cent. per Annum, for 126 Days? *Ans.* 11*l.* 13*s.* 2*d.* $\frac{1}{2}$.
3. What is the Interest of 560*l.* for 60 Days, at 5 per Cent. per Annum? *Ans.* 4*l.* 12*s.* 0*d.* $\frac{1}{2}$.
4. What is the Interest of 364*l.* 18*s.* for 154 Days, at 5 per Cent. per Annum? *Ans.* 7*l.* 13*s.* 11*d.* $\frac{1}{4}$.
5. What is the Interest of 725*l.* 15*s.* for 74 Days, at 4 per Cent. per Annum? *Ans.* 5*l.* 17*s.* 8*d.* $\frac{1}{2}$.
6. What is the Interest of 100*l.* from the 1st of June, 1755, to the 9th of March following, at 5 per Cent. per Annum? *Ans.* 3*l.* 17*s.* 3*d.*

2. When P, R, T are given to find A.

RULE. $prt + p = A$.

EXAMPLES.

1. What will 279*l.* 12*s.* amount to in 7 Years, at 4 $\frac{1}{2}$ per Cent. per Annum? *Answer.* 367*l.* 13*s.* 5*d.* 3,04 qrs. $279,6 \times ,045 \times 7 + 279,6 = 367,674$.
2. What will 320*l.* 17*s.* amount to in 5 Years, at 3 $\frac{1}{2}$ per Cent. per Annum? *Ans.* 376*l.* 19*s.* 11*d.* 2,8 qrs.
3. What will 679*l.* 13*s.* amount to in 6 Years, at 5 per Cent. per Annum? *Ans.* 883*l.* 10*s.* 10*d.* 3,2 qrs.

When there is any odd Time given with the whole Years, reduce the odd Time into Days, and work with the Decimal Parts of a Year which are equal to those Days.

4. What will 926*l.* 12*s.* amount to in 5 Years $\frac{1}{2}$, at 4 per Cent. per Annum? *Ans.* 1130*l.* 9*s.* 0*d.* 1,92 qrs.
5. What will 368*l.* 16*s.* amount to in 7 Years $\frac{1}{4}$, at 6 $\frac{1}{2}$ per Cent. per Annum? *Ans.* 554*l.* 11*s.* 7*d.* 3,68 qrs.
6. What will 273*l.* 18*s.* amount to in 4 Years, 175 Days, at 3 per Cent. per Annum? *Ans.* 310*l.* 14*s.* 1*d.* 3,35080064 qrs.

I. When A, R, T are given to find P.

RULE. $\frac{a}{rt + 1} = P$.

EXAMPLES.

1. What Principal being put to Interest, will amount to 367*l.* 13*s.* 5*d.* 3,04 *qrs.* in 7 Years, at $4\frac{1}{2}$ per Cent. per Annum? *Ans.* $3,045 \times 7 + 1 = 1,315$, then $367,674 \div 1,315 = 279*l.* 12*s.*$

2. What Principal being put to Interest, will amount to 376*l.* 19*s.* 11*d.* 2,8 in 5 Years, at $3\frac{1}{2}$ per Cent. per Annum? *Ans.* 320*l.* 17*s.*

3. What Principal being put to Interest, will amount to 883*l.* 10*s.* 10*d.* 3,2 *qrs.* in 6 Years, at 5 per Cent. per Annum? *Ans.* 679*l.* 13*s.*

4. What Principal being put to Interest will amount to 1130*l.* 9*s.* 0*d.* 1,92 *qrs.* in 5 Years $\frac{1}{2}$, at 4 per Cent. per Annum? *Answer,* 926*l.* 12*s.*

5. What Principal will amount to 554*l.* 11*s.* 7*d.* 3,68 *qrs.* in 7 Years $\frac{3}{4}$, at $6\frac{1}{2}$ per Cent. per Annum? *Ans.* 368*l.* 16*s.*

6. What Principal will amount to 310*l.* 14*s.* 1*d.* 3,35080064 *qrs.* in 4 Years, 175 Days, at 3 per Cent. per Annum? *Answer,* 273*l.* 18*s.*

IV. *When A, P, T are given to find R.*

$$\text{RULE. } \frac{a-p}{pt} = R.$$

EXAMPLES.

1. At what Rate per Cent. will 279*l.* 12*s.* amount to 367*l.* 13*s.* 5*d.* 3,04 *qrs.* in 7 Years?

Answer, $376,674 - 279,6 = 88,074$. $279,6 \times 7 = 1957,2$ then $88,074 \div 1957,2 = ,045$ or $4\frac{1}{2}$ per Cent.

2. At what Rate per Cent. will 320*l.* 17*s.* amount to 376*l.* 19*s.* 11*d.* 2,8 *qrs.* in 5 Years? *Ans.* $3\frac{1}{2}$ per Cent.

3. At what Rate per Cent. will 679*l.* 13*s.* amount to 883*l.* 10*s.* 10*d.* 3,2 *qrs.* in 6 Years? *Answer,* 5 per Cent.

4. At what Rate per Cent. will 926*l.* 12*s.* amount to 1130*l.* 9*s.* 0*d.* 1,92 *qrs.* in 5 Years $\frac{1}{2}$? *Ans.* 4 per Cent.

5. At what Rate per Cent. will 368*l.* 16*s.* amount to 554*l.* 11*s.* 7*d.* 3,68 *qrs.* in 7 Years, $\frac{3}{4}$? *Ans.* $6\frac{1}{2}$ per Cent.

6. At what Rate per Cent. will 273*l.* 18*s.* amount to 310*l.* 14*s.* 1*d.* 3,35080064 *qrs.* in 4 Years, 175 Days? *Answer,* 3 per Cent.

V. *When A, P, R are given to find T.*

$$\text{RULE. } \frac{a-p}{pr} = T.$$

1. In what Time will 279*l.* 12*s.* amount to 367*l.* 13*s.*
 5*d.* 3,04 *qrs.* at 4 $\frac{1}{2}$ per Cent.? Answer, 367,674—279,6—
 88,074. $279,6 \times .045 = 12,5820$ then $88,074 \div 12,5820 =$
 7 Years.

2. In what Time will 320*l.* 17*s.* amount to 376*l.* 19*s.*
 11*d.* 2,8 *qrs.* at 3 $\frac{1}{2}$ per Cent.? Answer, 5 Years.

3. In what Time will 679*l.* 13*s.* amount to 883*l.* 10*s.*
 10*d.* 3,2 *qrs.* at 5 per Cent. per Annum? Answer, 6 Years.

4. In what Time will 926*l.* 12*s.* amount to 1130*l.* 9*s.*
 0*d.* 1,92 *qrs.* at 4 per Cent. per Annum? Answ. 5 Years $\frac{1}{2}$.

5. In what Time will 368*l.* 16*s.* amount to 554*l.* 11*s.*
 7*d.* 3,68 *qrs.* at 6 $\frac{1}{2}$ per Cent.? Ans. 7 Years $\frac{1}{4}$.

6. In what Time will 273*l.* 18*s.* amount to 310*l.* 14*s.*
 1*d.* 3,35080064 *qrs.* at 3 per Cent.? Ans. 4 Years, 175 Days.

ANNUITIES, or PENSIONS, &c. in ARREARS.

Annuities, or Pensions, &c. are said to be in Arrears, when they are payable or due, either yearly, half-yearly, or quarterly, and are unpaid for any Number of Payments.

Note, U represents the Annuity, Pension, or yearly Rent, T, R, A, as before.

When U, R, T are given to find A.

RULE. $\frac{tu - tu}{2} \times r : +tu = A.$

EXAMPLES.

1. If a Salary of 150*l.* be forborne 5 Years, at 5 per Cent. what would it amount to? Ans. 825*l.*

$$5 \times 5 \times 150 - 5 \times 150 = 3000. \text{ then } \frac{3000}{2} \times .05 + 5 \times 150 = 825*l.*$$

2. If 250*l.* yearly Pension be forborne 7 Years, what will it amount to in that Time, at 6 per Cent.? Ans. 2065*l.*

3. There is a House let upon Lease for 5 Years $\frac{1}{2}$. at 60*l.* per Annum, what would be the Amount for the whole Time, at 4 $\frac{1}{2}$ per Cent.? Ans. 363*l.* 8*s.* 3*d.*

4. Suppose an annual Pension of 28*l.* remains unpaid for 8 Years, what would it amount to at 5 per Cent.? Ans. 263*l.* 4*s.*

Note, When the Annuities, &c. are to be paid half-yearly, or quarterly, then

For half-yearly Payments, take Half of the Ratio, Half of the Annuity, &c. and twice the Number of Years, — and,

For Quarterly Payments, take a fourth Part of the Ratio, a fourth Part of the Annuity, &c. and four Times the Number of Years, and work as before.

EXAMPLES.

5. If a Salary of 150*l.* payable every half Year, remains unpaid for 5 Years, what would it amount to in that Time, at 5 per Cent. per Annum? *Ans.* 834*l.* 7*s.* 6*d.*

6. If a Salary of 150*l.* payable every Quarter were left unpaid for 5 Years, what would it amount to in that Time, at 5 per Cent.? *Ans.* 839*l.* 1*s.* 3*d.*

Note, It may be observed by comparing these last Examples, that the Amount of the half yearly Payments are more advantageous than the yearly, and the quarterly more than half yearly.

II. When A, R, T are given to find U.

$$\text{RULE. } \frac{2a}{ttr - tr + 2t} = U.$$

EXAMPLES.

1. If a Salary amounted to 825*l.* in 5 Years, at 5 per Cent. what was the Salary? *Ans.* 150*l.*

$$825 \times 2 = 1650. \quad \overline{5 \times 5 \times .05} - \overline{5 \times .05} + \overline{5 \times 2} = 11 \text{ then } 1650 \div 11 = 150*l.*$$

2. If an House be let upon Lease for 5 Years $\frac{1}{2}$, and the Amount for that Time be 363*l.* 8*s.* 3*d.* at $4\frac{1}{2}$ per Cent. what is the yearly Rent? *Ans.* 60*l.*

3. If a Pension amounted to 2065*l.* in 7 Years, at 6 per Cent. what was the Pension? *Ans.* 250*l.*

4. Suppose the Amount of a Pension be 263*l.* 4*s.* in 8 Years, at 5 per Cent. what is the Pension? *Ans.* 28*l.*

Note, When the Payments are half-yearly, then take 4*a* and half of the Ratio, and twice the Number of Years, and if quarterly, then take 8*a*, one fourth of the Ratio, and four Times the Number of Years, and proceed as before.

5. If the Amount of a Salary payable half yearly for 5 Years, and at 5 per Cent. be 834*l.* 7*s.* 6*d.* what is the Salary? *Ans.* 150*l.*

6. If

6. If the Amount of an Annuity payable quarterly be 839*l.* 1*s.* 3*d.* for 5 Years, at 5 per Cent. what is the Annuity? *Ans.* 150*l.*

III. When *U*, *A*, *T* are given to find *R*.

RULE, $\frac{2a - 2ut}{ut - ut} = R.$

EXAMPLES.

1. If a Salary of 150*l.* per Annum, amounts to 825*l.* in 5 Years, what is the Rate per Cent.? *Ans.* 5 per Cent.

$$\frac{825 \times 2 - 150 \times 5 \times 2}{150 \times 5 \times 5 - 150 \times 5} = 5$$

2. If an House be let upon Lease for 5 Years $\frac{1}{2}$, at 60*l.* per Annum, and the Amount for that Time be 363*l.* 8*s.* 3*d.* what is the Rate per Cent.? *Ans.* $4\frac{1}{2}$ *l.* per Cent.

3. If a Pension of 250*l.* per Annum amounts to 2065*l.* in 7 Years, what is the Rate per Cent.? *Ans.* 6*l.* per Cent.

4. Suppose the Amount of an yearly Pension of 28*l.* be 263*l.* 4*s.* in 8 Years, what is the Rate per Cent.? *Ans.* 5*l.* per Cent.

Note, When the Payments are half-yearly take $4a - 4ut$ for a Dividend, and work with Half the Annuity and double the Number of Years for a Divisor; if quarterly take $8a - 8ut$ and work with a Fourth of the Annuity, and four Times the Number of Years.

5. If a Salary of 150*l.* per Annum, payable half-yearly, amounts to 834*l.* 7*s.* 6*d.* in 5 Years, what is the Rate per Cent.? *Ans.* 5 per Cent.

6. If an Annuity of 150*l.* per Annum, payable quarterly, amounts to 839*l.* 1*s.* 3*d.* in 5 Years, what is the Rate per Cent.? *Ans.* 5 per Cent.

IV. When *U*, *A*, *R* are given to find *T*.

RULE. First $\frac{2}{r} - 1 = x$ then $\sqrt{\frac{2a}{ur} + \frac{xx}{4}} : -\frac{x}{2} = T.$

EXAMPLES.

1. In what Time will a Salary of 150*l.* per Annum, amount to 825*l.* at 5 per Cent.? *Ans.* 5 Years.

$$\frac{2}{,05} - 1 = 39 \frac{825 \times 2}{150 \times ,05} = 220 \frac{39 \times 39}{4} = 380,25$$

$$\sqrt{220 + 380,25} = 24,5 - \frac{39}{2} = 5 \text{ Years.}$$

2. If an House is let upon Lease for a certain Time for 60*l.* per Annum, and the Amount be 363*l.* 8*s.* 3*d.* at 4 $\frac{1}{2}$ per Cent. I desire to know the Time it was let for? *Ans.* 5 $\frac{1}{2}$ Years.

3. If a Pension of 250*l.* per Annum being forborne a certain Time, amounts to 2065*l.* at 6 per Cent. what was the Time of Forbearance? *Ans.* 7 Years.

4. In what Time will a yearly Pension of 28*l.* amount to 263*l.* 4*s.* at 5 per Cent.? *Ans.* 8 Years.

Note, If the Payments are half-yearly, take Half the Ratio and Half the Annuity, if quarterly one Fourth of the Ratio and one Fourth of the Annuity, and T will be equal to those half-yearly or quarterly Payments.

5. If an Annuity of 150*l.* per Annum, payable half yearly amounts to 834*l.* 7*s.* 6*d.* at 5 per Cent. what Time was the Payment forborne? *Ans.* 5 Years.

6. If an yearly Pension of 150*l.* payable quarterly, amounts to 839*l.* 1*s.* 3*d.* at 5 per Cent. what was the Time of Forbearance? *Ans.* 5 Years.

PRESENT WORTH of ANNUITIES, &c.

Note, P represents the present Worth U, T, R as before.

I. When U, T, R are given to find P.

$$\text{RULE. } \frac{tr - tr + 2t}{-2tr + 2} : Xu = P.$$

EXAMPLES.

1. What is the present Worth of 150*l.* per Annum, to continue 5 Years at 5 per Cent.? *Ans.* 660*l.*

$$5 \times 5 \times ,05 - 5 \times ,05 + 5 \times 2 = 11. \quad 5 \times ,05 \times 2 + 2 = 2,5 \text{ then } 11 \div 2,5 \times 150 = 660 \text{ l.}$$

2. What is the yearly Rent of a House of 60*l.* to continue 5 $\frac{1}{2}$ Years worth in ready Money, at 4 $\frac{1}{2}$ per Cent.? *Ans.* 291*l.* 6*s.* 3*d.*

3. What is the present Worth of 250*l.* per Annum, to continue 7 Years at 6 per Cent.? *Ans.* 1454*l.* 4*s.* 6*d.*

4. What is a Pension of 28*l.* per Annum worth in ready Money, at 5 per Cent. for 8 Years? *Ans.* 188*l.*

Note,

Note, The same Thing is to be observed here as in the first Rule of Annuities in Arrears; concerning half-yearly and quarterly Payments.

5. What is the present Worth of 150*l.* payable half-yearly for 5 Years, at 5 per Cent.? *Ans.* 667*l.* 10*s.*

6. What is the present Worth of 150*l.* payable quarterly for 5 Years, at 5 per Cent.? *Ans.* 671*l.* 5*s.*

Note, By comparing the last Examples, it will be found that the present Worth of half-yearly Payments is more advantageous than yearly; and quarterly, than half-yearly.

II. When P, T, R given to find U.

$$\text{RULE. } \frac{tr+1}{ttr-tr+2t} ; \times 2p = U.$$

EXAMPLES.

1. If the present Worth of a Salary be 660*l.* to continue 5 Years at 5 per Cent. what was the Salary? *Ans.* 150*l.*

$$5 \times 1,05 + 1 = 1,25 . 5 \times 5 \times 5,05 - 5 \times 1,05 + 10 = 11$$

$$\text{then } \frac{1,25}{11} \times 660 \times 2 = 150.$$

2. There is an House let upon Lease for 5 $\frac{1}{2}$ Years to come, I desire to know the yearly Rent, when the present Worth at 4 $\frac{1}{2}$ per Cent. is 291*l.* 6*s.* 3*d.*? *Ans.* 60*l.*

3. What Annuity is that which for 7 Years Continuance at 6 per Cent. produces 1454*l.* 4*s.* 6*d.* present Worth? *Ans.* 250*l.*

4. What Annuity is that which for 8 Years Continuance, produces 188*l.* for the present Worth, at 5 per Cent.? *Ans.* 28*l.*

Note, When the Payments are half-yearly, take half the Ratio, twice the Number of Years, and multiply by 4*p.* and when quarterly take one fourth of the Ratio four Times the Number of Years and multiply by 8*p.*

5. There is an Annuity payable half-yearly, for 5 Years to come, what is the yearly Rent, when the present Worth at 5 per Cent. is 667*l.* 10*s.*? *Ans.* 150*l.*

6. There is an Annuity payable quarterly, for 5 Years to come, I desire to know the yearly Income, when the present Worth at 5 per Cent. is 671*l.* 5*s.*? *Ans.* 150*l.*

III. When U, P, T are given to find R.

$$\text{RULE. } \frac{ut-p \times 2}{2pt+ut-utt} = R.$$

EXAMPLES.

1. At what Rate *per Cent.* will an Annuity of 150*l.* *per Annum* to continue 5 Years, produce the present Worth of 660*l.*? *Ans.* 5 *per Cent.*

$$\begin{array}{r} 150 \times 5 - 660 \times 2 = 180. \quad 2 \times 660 \times 5 + 150 \times 5 - 150 \times 5 \times 5 = 3600 \\ \text{then } 180 \div 3600 = .05 = 5 \text{ per Cent.} \end{array}$$

2. If an yearly Rent of 60*l.* *per Annum* to continue 5 $\frac{1}{2}$ Years, produces 291*l.* 6*s.* 3*d.* for the present Worth, what is the Rate *per Cent.*? *Ans.* 4 $\frac{1}{2}$ *per Cent.*

3. If an Annuity of 250*l.* *per Annum*, to continue 7 Years, produce, 1454*l.* 4*s.* 6*d.* for the present Worth, what is the Rate *per Cent.*? *Ans.* 6 *per Cent.*

4. If a Pension of 28*l.* *per Annum*, to continue 8 Years produces 188*l.* for the present Worth, what is the Rate *per Cent.*? *Ans.* 5 *per Cent.*

Note, When the Annuities or Rents, &c. are to be paid half-yearly, or quarterly, then

For half-yearly Payments take half of the Annuity, &c. and twice the Number of Years, the Quotient will be the Ratio of half the Rate *per Cent.* and

For quarterly Payments take a fourth Part of the Annuity, &c. and four Times the Number of Years, the Quotient will be the Ratio of a fourth Part of the Rate *per Cent.*

5. An Annuity of 150*l.* *per Annum*, payable half-yearly, having 5 Years to come, is sold for 667*l.* 10*s.* what is the Rate *per Cent.*? *Ans.* 5 *per Cent.*

6. If an Annuity of 150*l.* *per Annum*, payable quarterly, having 5 Years to come, be sold for 671*l.* 5*s.* what is the Rate *per Cent.*? *Ans.* 5 *per Cent.*

IV. When U, P, R are given to find T.

$$\text{RULE. } \frac{2}{r} - \frac{2p}{u} - 1 = x \text{ then } \frac{2p}{\sqrt{ur}} + \frac{xx}{4} - \frac{x}{2} = T.$$

EXAMPLES.

If an Annuity of 150*l.* *per Annum* produce 660*l.* for the present Worth, at 5 *per Cent.* what is the Time of its Continuance? *Ans.* 5 Years.

$$\frac{2}{,05} \quad \frac{660 \times 2}{150} \quad -1 = 30,2$$

$$\frac{660 \times 2}{150 \times ,05} = 176$$

$$\frac{30,2 \times 30,2}{4} = 228,01 \text{ then } \sqrt{228,01 + 176} = 20,1$$

$$20,1 - \frac{30,2}{2} = 5 \text{ Years.}$$

2. For what Time may a Salary of 60 l. be purchased for 291 l. 6 s. 3 d. at $4\frac{1}{2}$ per Cent.? *Ans.* $5\frac{1}{2}$ Years.

3. For how long Time may 250 l. per Annum, be purchased for 1454 l. 4 s. 6 d. at 6 per Cent.? *Ans.* 7 Years.

4. What Time may a Pension of 28 l. per Annum be bought for 188 l. at 5 per Cent.? *Ans.* 8 Years.

Note, When the Payments are half-yearly, then U will be equal to Half the Annuity, &c. R Half the Ratio, and T the Number of Payments, and

When the Payments are quarterly, U will be equal to a fourth Part of the Annuity, &c. R. the fourth of the Ratio, and T the Number of Payments.

5. An Annuity of 150 l. per Annum, payable half-yearly, is sold for 667 l. 10 s. at 5 per Cent. I desire to know the Number of Payments, and the Time to come? *Ans.* 10 Payments, 5 Years.

6. An Annuity of 150 l. per Annum, payable quarterly, is sold for 671 l. 5 s. at 5 per Cent. what is the Number of Payments and Time to come? *Ans.* 20 Payments, 5 Years.

ANNUITIES, &c. taken in REVERSION.

1. To find the present Worth of an Annuity, &c. taken in Reversion.

RULE. Find the present Worth of the yearly Sum at the given Rate, and for the Time of its Continuance,

$$\frac{ttr - tr + 2t}{2tr + 2} : Xu = P.$$

2. Change P into A, and find what Principal being put to Interest will amount to A, at the same Rate, and for the Time to come before the Annuity, &c. commences, thus,

$$\frac{a}{tr + 1} = P.$$

EXAMPLES.

1. What is the present Worth of an Annuity of 150*l.* per Annum, to continue 5 Years, but not to commence till the End of 4 Years, allowing 5 per Cent. to the Purchaser? *Ans.* 550*l.*

$$\frac{5 \times 5 \times .05 - 5 \times .05 + 2 \times 5}{5 \times .05 \times 2 + 2} = 4,4 \times 150 = 660 \quad \frac{5 \times .05 + 1}{4 \times .05 + 1} = 550$$

2. What is the present Worth of a Lease of 50*l.* per Annum, to continue 4 Years, but is not to commence till the End of 5 Years, allowing 4 per Cent. to the Purchaser? *Ans.* 152*l.* 5*s.* 11*d.* 3*qrs.*

3. A Person having the Promise of a Pension of 20*l.* per Annum, for 8 Years, but is not to commence till the End of 4 Years, is willing to dispose of the same for present Money at 5 per Cent. what will be the present Worth? *Ans.* 111*l.* 18*s.* 1, 14*d.*

4. A Legacy of 40*l.* being left for 6 Years to a Person of 15 Years of Age, but is not to commence till he is 21. He wanting Money, is desirous of selling the same at 4 per Cent. what is the present Worth? *Ans.* 171*l.* 14*s.*

II. To find the yearly Income of an Annuity, &c. in Reversion.

RULE I. Find the Amount of the present Worth at the given Rate, and for the Time before the Reversion, thus,

$$ptr + p = A$$

2. Change *A* into *P*, and find what Annuity being sold will produce *P*, at the same Rate, and for the Time of its Continuance, thus,

$$\frac{tr + 1}{tr - tr + 2t} : x2p = U.$$

EXAMPLES.

1. A Person having an Annuity left him for 5 Years, which does not commence till the End of 4 Years, has disposed of it for the present Payment of 550*l.* allowing 5 per Cent. to the Purchaser, what is the yearly Income? *Ans.* 150*l.*

$$550 \times 4 \times .05 + 550 = 660 \quad \frac{5 \times .05 + 1}{5 \times 5 \times .05 - 5 \times .05 + 5 \times 2} = 113636 \times 660 \times 2 = 150 \text{ l.}$$

2. There

2. There is a Lease of an House taken for 4 Years, but not to commence till the End of 5 Years, the Lessee would sell the same for 152 *l.* 6 *s.* present Payment, allowing 4 *per Cent.* to the Purchaser, what is the yearly Rent? *Ans.* 50 *l.*

3. A Person having the Promise of a Pension for 8 Years, which does not commence till the End of 4 Years, has disposed of the same for 111 *l.* 18 *s.* 1 *d.*, 14 present Money, allowing 5 *per Cent.* to the Purchaser, what was the Pension? *Answer,* 20 *l.*

4. There is a certain Legacy left to a Person of 15 Years of Age, which is to be continued for 6 Years, but not to commence till he arrives to the Age of 21; he wanting a Sum of Money, sells it for 171 *l.* 14 *s.* allowing 4 *per Cent.* to the Buyer, what was the Annuity left him? *Answer,* 40 *l.*

REBATE OR DISCOUNT

Note, **S** Represents the Sum to be discounted.

P the present Worth.

T the Time.

R the Ratio.

When **S**, **T**, **R** are given to find **P**.

$$\text{RULE. } \frac{S}{tr+1} = P.$$

EXAMPLES.

1. What is the present Worth of 357 *l.* 10 *s.* to be paid 9 Months hence, at 5 *per Cent.*? *Answer,* 344 *l.* 11 *s.* 6 *d.* 2,88 *grs.*

$$\frac{357,5}{,75 \times ,05 + 1} = 344,5778.$$

2. What is the present Worth of 275 *l.* 10 *s.* due for 7 Months hence, at 5 *per Cent.*? *Ans.* 267 *l.* 13 *s.* 10 *d.*, 164.

3. What is the present Worth of 875 *l.* 5 *s.* 6 *d.* due 5 Months hence, at 4 $\frac{1}{2}$ *per Cent.*? *Answer,* 859 *l.* 3 *s.* 3 *d.* 3,2544 *grs.*

4. How much ready Money can I receive for a Note of 75 *l.* due 15 Months hence, at 5 *per Cent.*? *Answer,* 70 *l.* 11 *s.* 9 *d.*, 1752

II. *When P, T, R are given to find S.*

RULE. $p + \frac{p}{r} = S$.

EXAMPLES.

1. If the present Worth of a Sum of Money due 9 Months hence, allowing 5 per Cent. to be 344 *l.* 11 *s.* 6 *d.* 2,688 *qrs.* what was the Sum first due? *Answer*, 357 *l.* 10 *s.*

$$344,5778 \times .75 \times .05 + 344,5778 = 357 \text{ l. } 10 \text{ s.}$$

2. A Person owing a certain Sum payable 7 Months hence, agrees with the Creditor to pay him down 267 *l.* 13 *s.* 10 *d.* ,164, allowing 5 per Cent. for present Payment, what is the Debt? *Ans.* 275 *l.* 10 *s.*

3. A Person receives 859 *l.* 3 *s.* 3 *d.* 3,2544 *qrs.* for a Sum of Money due 5 Months hence, allowing the Debtor 4 $\frac{1}{2}$ per Cent. for present Payment, what was the Sum due? *Answer*, 875 *l.* 5 *s.* 6 *d.*

4. A Person paid 70 *l.* 11 *s.* 9 *d.* ,1752 for a Debt due 15 Months hence, he being allowed 5 per Cent. for the Discount, how much was the Debt? *Answer*, 75 *l.*

III. *When S, P, T are given to find R.*

RULE. $\frac{s-p}{tp} = R$.

EXAMPLES.

1. At what Rate per Cent. will 357 *l.* 10 *s.* payable 9 Months hence produce 344 *l.* 11 *s.* 6 *d.* 2,88 *qrs.* for present Payment?

$$\frac{357,5 - 344,5778}{344,5778 \times .75} = .05 = 5 \text{ per Cent.}$$

2. At what Rate per Cent. will 275 *l.* 10 *s.* payable 7 Months hence, produce 267 *l.* 13 *s.* 10 *d.* ,164 for present Payment? *Answer*, 5 per Cent.

3. At what Rate per Cent. will 875 *l.* 5 *s.* payable 5 Months hence, produce the present Payment of 859 *l.* 3 *s.* 3 *d.* 3,2544 *qrs.*? *Answer*, 4 $\frac{1}{2}$ per Cent.

4. At what Rate per Cent. will 75 *l.* payable 15 Months hence, produce the present Payment of 70 *l.* 11 *s.* 9 *d.* ,1752? *Answer*, 5 per Cent.

IV. *When S, P, R, are given to find T.*

RULE. $\frac{s-p}{rp} = T$.

EXAM-

EXAMPLES.

1. The present Worth of 357 *l.* 10 *s.* due for a certain Time to come is 344 *l.* 11 *s.* 6 *d.* 2,88 *qrs.* at 5 *per Cent.* in what Time should the Sum have been paid without any Rebate?

$$\text{Answer, } \frac{357,5 - 344,5778}{344,5778 \times ,05} = ,75 = 9 \text{ Months.}$$

2. The present Worth of 275 *l.* 10 *s.* due for a certain Time to come, is 267 *l.* 13 *s.* 10 *d.* ,164 at 5 *per Cent.* what Time should the Sum have been paid without any Rebate? *Answer, 7 Months.*

3. A Person receives 859 *l.* 3 *s.* 3 *d.* 3,2544 *qrs.* for 875 *l.* 5 *s.* due at a certain Time to come, allowing 4 $\frac{1}{2}$ *per Cent.* Discount; I desire to know in what Time the Debt should have been discharged without any Rebate? *Answer, 5 Months.*

4. I have received 70 *l.* 11 *s.* 9 *d.* ,1752 for a Debt of 75 *l.* allowing the Person 5 *per Cent.* for prompt Payment, I desire to know when the Debt would have been payable without the Rebate? *Answer, 15 Months.*

EQUATION of PAYMENTS.

To find the equated Time for the Payment of a Sum of Money due at several Times.

RULE. Find the present Worth of each $\frac{s}{tr+1} = P$.
Payment for its respective Time, thus $tr+1$
Add all the present Worths together, then $s-p = D$.
and $\frac{d}{pr} = E$.

EXAMPLES.

1. A owes B 200 *l.* whereof 40 *l.* is to be paid at 3 Months 60 *l.* at 6 Months, and 100 *l.* at 9 Months at what time may the whole Debt be paid together, Rebate being made at 5 *per Cent.*? *Answer,*

$$\frac{40}{1,0125} = 39,5061. \quad \frac{60}{1,025} = 58,5365. \quad \frac{100}{1,0375} = 96,3855$$

$$\text{then } 200 - 39,5061 + 58,5365 + 96,3855 = 5,5719$$

$$\frac{5,5719}{194,4281 \times ,05} = ,57315 = 6 \text{ Months } 26 \text{ Days.}$$

2. *B* owes *C* 800*l.* whereof 200*l.* is to be paid at 3 Months, 200*l.* at 4 Months, and 400*l.* at 6 Months; but they agreeing to make but one Payment of the Whole, at the Rate of 5 *per Cent.* Rebate, the true equated Time is demanded? *Answer, 4 Months, 22 Days.*

3. *A* owes *B* 1200*l.* which is to be paid as follows; 200*l.* down, 500*l.* at the End of 10 Months, and the rest at the End of 20 Months; but they agreeing to have but one Payment of the whole; Rebate at 3 *per Cent.* the true equated Time is demanded? *Ans. 1 Year, 11 Days.*

COMPOUND INTEREST.

THE Letters made use of in Compound Interest are,

A the Amount.

P the Principal.

T the Time.

R the Amount of 1*l.* for 1 Year, at any given Rate; which is thus found.

As 100 : 105 :: 1 : 1,05. As 100 : 105,5 :: 1 : 1,055.

A TABLE of the Amounts of 1*l.* for 1 Year.

<i>Rates.</i> <i>per Cent.</i>	<i>Amts.</i> <i>of 1 l.</i>	<i>Rates.</i> <i>per Cent.</i>	<i>Amts.</i> <i>of 1 l.</i>	<i>Rates.</i> <i>per Cent.</i>	<i>Amts.</i> <i>of 1 l.</i>
3	1,03	5 $\frac{1}{2}$	1,055	8	1,08
3 $\frac{1}{2}$	1,035	6	1,06	8 $\frac{1}{2}$	1,085
4	1,04	6 $\frac{1}{2}$	1,065	9	1,09
4 $\frac{1}{2}$	1,045	7	1,07	9 $\frac{1}{2}$	1,095
5	1,05	7 $\frac{1}{2}$	1,075	10	1,1

A TABLE shewing the Amount of 1 l. for any Number of Years under 31, at 5 and 6 per Cent. per Annum.

Years.	5	Rates.	6	Years.	5	Rates.	6
1	1,05000		1,06000	16	2,18287		2,54035
2	1,10250		1,12360	17	2,29201		2,69277
3	1,15762		1,19101	18	2,40662		2,85434
4	1,21550		1,26247	19	2,52695		3,02559
5	1,27628		1,33822	20	2,65329		3,20713
6	1,34009		1,41852	21	2,78596		3,39956
7	1,40710		1,50363	22	2,92526		3,60353
8	1,47745		1,59384	23	3,07152		3,81975
9	1,55132		1,68948	24	3,22510		4,04893
10	1,62889		1,79084	25	3,38635		4,29187
11	1,71034		1,89829	26	3,55567		4,54938
12	1,79585		2,01219	27	3,73345		4,82234
13	1,88565		2,13292	28	3,92013		5,11168
14	1,97993		2,26090	29	4,11613		5,41838
15	2,07892		2,39655	30	4,32194		5,74349

Note, The above Table is thus made: As 100 : 105 :: 1 : 1,05 for the first Year; then, As 190 : 105 :: 1,05 : 1,1025 2d Year, &c.

When P, T, R are given to find A.

RULE. $p \times r^t = A$.

EXAMPLES.

1. What will 225 l. amount to in 3 Years Time, at 5 per Cent. per Annum? Ans. $1,05 \times 1,05 \times 1,05 = 1,157625$ then $1,157625 \times 225 = 260$ l. 9 s. 3 d. 3 qrs.

2. What will 200 l. amount to in 4 Years, at 5 per Cent. per Annum? Answer, 243 l. 2,025 s.

3. What will 450 l. amount to in 5 Years, at 4 per Cent. per Annum? Answer, 547 l. 9 s. 10 d. 2,0538368 qrs.

4. What will 500 l. amount to in 4 Years, at $5 \frac{1}{2}$ per Cent. per Annum? Answer, 619 l. 8 s. 2 d. 3,8323 qrs.

II. When A, R, T are given to find P.

RULE. $\frac{a}{r^t} = P$.

EXAMPLES.

1. What Principal being put to Interest will amount to 260 *l.* 9 *s.* 3 *d.* 3 *qrs.* in 3 Years, at 5 *per Cent. per Annum*?

$$1,05 \times 1,05 \times 1,05 = 1,157625. \quad \frac{260,465625}{1,157625} = 225 \text{ l.}$$

2. What Principal being put to Interest will amount to 243 *l.* 2,025 *s.* in 4 Years, at 5 *per Cent. per Annum*? *Ans.* 200 *l.*

3. What Principal will amount to 547 *l.* 9 *s.* 10 *d.* 2,0538368 *qrs.* in 5 Years, at 4 *per Cent. per Annum*? *Ans.* 450 *l.*

4. What Principal will amount to 619 *l.* 8 *s.* 2 *d.* 3,8323 *qrs.* in 4 Years; at 5 $\frac{1}{2}$ *per Cent.*? *Answer,* 500 *l.*

III. *When P, A, T are given to find R.*

RULE. $\frac{a}{p} = r^t$. which being extracted by the Rules of Extraction, (the Time given in the Question shewing the Power) will give R.

EXAMPLES.

1. At what Rate *per Cent.* will 225 *l.* amount to 260 *l.* 9 *s.* 3 *d.* 3 *qrs.* in 3 Years?

Ans. $\frac{260,465625}{225} = 1,157625$. the Cube Root of which (it being the third Power) = 1,05 = 5 *per Cent.*

2. At what Rate *per Cent.* will 200 *l.* amount to 243 *l.* 2,025 *s.* in 4 Years? *Answer,* 5 *per Cent.*

3. At what Rate *per Cent.* will 450 *l.* amount to 547 *l.* 9 *s.* 10 *d.* 2,0538368 *qrs.* in 5 Years? *Ans.* 4 *per Cent.*

4. At what Rate *per Cent.* will 500 *l.* amount to 619 *l.* 8 *s.* 2 *d.* 3,8323 *qrs.* in 4 Years? *Ans.* 5 $\frac{1}{2}$ *per Cent.*

IV. *When P, A, R are given to find T.*

RULE. $\frac{a}{p} = r^t$ which being continually divided by R, till nothing remains, the Number of those Divisions will be equal to T.

EXAMPLES.

1. In what Time will 225 l. amount to 260 l. 9 s. 3 d. 3 qrs. at 5 per Cent.?

$$\frac{260,465625}{225} = 1,157625 \frac{1,157625}{1,05} = 1,1025 \frac{1,1025}{1,05} = 1,05$$

$$\frac{1,05}{1,05} = 1. \text{ the Number of Divisions being 3 } = \text{Time sought.}$$

2. In what Time will 200 l. amount to 243 l. 2,025 s. at 5 per Cent.? Ans. 4 Years.

3. In what Time will 450 l. amount to 547 l. 9 s. 10 d. 2,0538368 qrs. at 4 per Cent.? Ans. 5 Years.

4. In what Time will 500 l. amount to 619 l. 8 s. 2 d. 3,8323 qrs. at 5 $\frac{1}{2}$ per Cent.? Ans. 4 Years.

ANNUITIES, or PENSIONS in ARREARS.

Note, U represents the Annuity, Pension, or yearly Rent, A, R, T, as before.

A TABLE shewing the Amount of 1 l. Annuity from any Number of Years under 31, at 5 and 6 per Cent. per Annum.

Years.	5 Rates.	6	Years.	5 Rates.	6
1	1,00000	1,00000	16	23,65749	25,67252
2	2,05000	2,06000	17	25,84036	28,21288
3	3,15250	3,18360	18	28,13238	30,90565
4	4,31012	4,37461	19	30,53900	33,75999
5	5,52563	5,63709	20	33,06595	36,78559
6	6,80191	6,97532	21	35,71925	39,99272
7	8,14200	8,39383	22	38,50521	43,39229
8	9,54910	9,89746	23	41,43047	46,99582
9	11,02656	11,49131	24	44,50199	50,81557
10	12,57789	13,18079	25	47,72709	54,86451
11	14,20678	14,97164	26	51,11345	59,15638
12	15,91712	16,86994	27	54,66912	63,70576
13	17,71298	18,88213	28	58,40258	68,52811
14	19,59863	21,01506	29	62,32271	73,63979
15	21,57856	22,27507	30	66,43684	79,05818

Note, The above Table is made thus, take the first Year's Amount, which is 1 l. multiply it by 1,05 + 1 = 2,05 = 2d Year's Amount, which also multiply by 1,05 + 1 = 3,1525 3d Year's Amount, &c. 1.

I. *When U, T, R are given to find A.*

RULE. $\frac{ur^t - u}{r - 1} = A.$ or by the Table thus,

Multiply the Amount of 1 *l.* for the Number of Years, and at the Rate *per Cent.* given in the Question, by the Annuity, Pension, &c. and it will give the Answer.

EXAMPLES.

1. What will an Annuity of 50 *l. per Annum*, payable yearly, amount to in 4 Years, at 5 *per Cent.*?

Answer, $1,05 \times 1,05 \times 1,05 \times 1,05 \times 50 = 60,7753125$
 then $\frac{60,7753125 - 50}{1,05 - 1} = 215 \text{ l. } 10 \text{ s. } 1 \text{ d. } 2 \text{ qrs.}$

or, by the Table, thus,

$$4,31012 \times 50 = 215 \text{ l. } 10 \text{ s. } 1 \text{ d. } 1,76 \text{ qrs.}$$

2. What will a Pension of 45 *l. per Annum* payable yearly amount to in 5 Years, at 5 *per Cent.*? Ans. 248 *l.* 13 *s.* 0 *d.* 3,27 *qrs.*

3. If a Salary of 40 *l. per Annum* to be paid yearly be forborne 6 Years, at 6 *per Cent.* what is the Amount? Ans. 279 *l.* 0 *s.* 3,072 *d.*

4. If an Annuity of 75 *l. per Annum*, payable yearly, be omitted to be paid for 10 Years, at 6 *per Cent.* what is the Amount? Answer, 988 *l.* 11 *s.* 2,22 *d.*

II. *When U, T, R are given to find U.*

RULE. $\frac{ar - a}{r^t - 1} = U.$

EXAMPLES.

1. What Annuity being forborne 4 Years will amount to 215 *l.* 10 *s.* 1 *d.* 2 *qrs.* at 5 *per Cent.*?

Answer, $\frac{215,50625 \times 1,05 - 215,50625}{1,05 \times 1,05 \times 1,05 \times 1,05 - 1} = 50 \text{ l.}$

2. What Pension being forborne 5 Years will amount to 248 *l.* 13 *s.* 0 *d.* 3,27 *qrs.* at 5 per Cent.? *Ans.* 45 *l.*

3. What Salary being omitted to be paid 6 Years, will amount to 279 *l.* 0 *s.* 3,072 *d.* at 6 per Cent.? *Ans.* 40 *l.*

4. If the Payment of an Annuity being forborne 10 Years, amount to 988 *l.* 11 *s.* 2,22 *d.* at 6 per Cent. what is the Annuity? *Answer,* 75 *l.*

III. When U, A, R are given to find T.

RULE. $\frac{a+u-a}{u} = r^t$ which being continually divided by R, 'till nothing remains, the Number of those Divisions will be equal to T.

EXAMPLES.

1. In what Time will 50 *l.* per Annum, amount to 215 *l.* 10 *s.* 1 *d.* 2 *qrs.* at 5 per Cent. for Non-payment?

$$\text{Ans. } \frac{215,50625 \times 1,05}{50} - 215,50625 = 1,21550625$$

which being continually divided by R, the Number of those Divisions will be = 4 Years.

2. In what Time will 45 *l.* per Annum amount to 248 *l.* 13 *s.* 0 *d.* 3,27 *qrs.* allowing 5 per Cent. for Forbearance of Payment? *Ans.* 5 Years.

3. In what Time will 40 *l.* per Annum amount to 279 *l.* 0 *s.* 3,072 *d.* at 6 per Cent.? *Ans.* 6 Years.

4. In what Time will 75 *l.* per Annum amount to 988 *l.* 11 *s.* 2,22 *d.* allowing 6 per Cent. for Forbearance of Payment? *Ans.* 10 Years.

PRESENT WORTH of ANNUITIES, PENSIONS, &c.

A TABLE shewing the present Worth of 1 *l.* Annuity for any Number of Years under 31, Rebate at 5 and 6 *per Cent.*

<i>Years.</i>	5	<i>Rates</i>	6	<i>Years.</i>	5	<i>Rates.</i>	6
1	0,95238		0,94336	16	10,83777		10,10589
2	1,85941		1,83339	17	11,27406		10,47726
3	2,72324		2,67301	18	11,68958		10,82760
4	3,54595		3,46510	19	12,08532		11,15811
5	4,32947		4,21236	20	12,46221		11,46992
6	5,07569		4,91732	21	12,82115		11,76407
7	5,78637		5,58238	22	13,16300		12,04158
8	6,46321		6,20979	23	13,48857		12,30338
9	7,10782		6,80169	24	13,79864		12,55035
10	7,72173		7,36008	25	14,09394		12,78335
11	8,30641		7,88687	26	14,37518		13,00316
12	8,86325		8,38384	27	14,64303		13,21053
13	9,39357		8,85268	28	14,89812		13,40616
14	9,89864		9,29498	29	15,14107		13,59072
15	10,37965		9,71225	30	15,37245		13,76483

Note, *The above Table is thus made, divide 1 *l.* by 1,05 = ,95238 the present Worth of the first Year, which ÷ 1,05 = ,90703 added to the first Year's present Worth = 1,85941 the second Year's present Worth, then, ,90703 ÷ 1,05 and the Quotient added to 1,85941 = 2,72324 the third Year's present Worth, &c.*

I. *When U, T, R are given to find P.*

$$\text{RULE. } \frac{u}{r-1} = P.$$

or, *by the Table thus,*

Multiply the present Worth of 1 *l.* Annuity for the Time and Rate *per Cent.* given, by the Annuity, Pension, &c. it will give the Answer.

EXAM-

EXAMPLES.

1. What is the present Worth of an Annuity of 30 *l.* per Annum, to continue 7 Years, at 6 per Cent.? *Ans.* 167 *l.* 9 *s.* 5,184 *d.*

$$\frac{30}{1,50363} = 19,9517. \quad 30 - 19,9517 = 10,0483. \quad \frac{10,0483}{1,06 - 1} = 167,4716. \quad \text{By the Table } 5,58238 \times 30 = 167,4714.$$

2. What is the present Worth of a Pension of 40 *l.* per Annum, to continue 8 Years, at 5 per Cent.? *Ans.* 258 *l.* 10 *s.* 6 *d.* 3,264 *qrs.*

3. What is the present Worth of a Salary of 34 *l.* to continue 7 Years, at 6 per Cent.? *Ans.* 195 *l.* 7 *s.* 7 *d.* 3,968 *qrs.*

4. What is the yearly Rent of 50 *l.* to continue 5 Years, Worth in ready Money, at 5 per Cent.? *Ans.* 216 *l.* 9 *s.* 5 *d.* 2,56 *qrs.*

II. When P, T, R are given to find U.

$$\text{RULE. } \frac{pr^t \times r - pr^t}{r - 1} = U.$$

EXAMPLES.

1. If an Annuity be purchased for 167 *l.* 9 *s.* 5,184 *d.* to be continued 7 Years, at 6 per Cent. what is the Annuity?

$$\text{Ans. } \frac{167,4716 \times 1,50363 \times 1,06 - 167,4716 \times 1,50363}{1,50363 - 1} = 30.$$

2. If the present Payment of 258 *l.* 10 *s.* 6 *d.* 3,264 *qrs.* be made for a Salary 8 Years to come, at 5 per Cent. what was the Salary? *Ans.* 40 *l.*

3. If the present Payment of 195 *l.* 7 *s.* 7 *d.* 3,968 *qrs.* were required for a Pension for 7 Years to come, at 6 per Cent. what is the Pension? *Ans.* 35 *l.*

4. If the present Worth of an Annuity 5 Years to come, be 215 *l.* 9 *s.* 5 *d.* 2,56 *qrs.* at 5 per Cent. what is that Annuity? *Ans.* 50 *l.*

III. When U, P, R are given to find T.

RULE. $\frac{u}{p+u-pr} = r^t$ which being continually divided by R, till nothing remains, the Number of those Divisions will be equal to T.

EXAMPLES.

1. How long may a Lease of 30 l. yearly Rent be had for 167 l. 9 s. 5, 184 d. allowing 6 per Cent. to the Purchaser?

Ans. $\frac{30}{167,4716+30-177,5198} = 1,50363$ which being continually divided, the Number of those Divisions will be 7 = to T.

2. If 258 l. 10 s. 6 d. 3, 264 qrs. paid down for a Lease of 20 l. per Annum, at 5 per Cent. how long is the Lease purchased for? Ans. 8 Years.

3. If an House is let upon Lease for 35 l. per Annum, and the Lessee makes present Payment of 195 l. 7 s. 8 d. he being allowed 6 per Cent. I demand how long the Lease is purchased for? Ans. 7 Years,

4. For what Time may a Lease of 50 l. per Annum, be purchased, when present Payment is made of 216 l. 9 s. 5 d. 2, 56 qrs. at 5 per Cent.? Ans. 5 Years.

ANNUITIES, LEASES, &c. taken in REVERSION.

To find the present Worth of Annuities, Leases, &c. taken in Reversion.

RULE. I. Find the present Worth of the Annuity, &c. at the given Rate, and for the Time of its Continuance;

$$u \frac{u}{r^t} = P.$$

thus,

Change P into A, and find what Principal being put to Interest will amount to P at the same Rate, and for the Time to come, before the Annuity commences, which will be the present Worth of the Annuity, &c.

$$\frac{a}{r^t} = P.$$

thus,

EXAM-

EXAMPLES.

1. What is the present Worth of a Reversion of a Lease of 40*l.* *per Annum*, to continue 6 Years, but not to commence till the End of two Years, allowing 6 *per Cent.* to the Purchaser? *Ans.* 175*l.* 1*s.* 1*d.* 2,048 *qrs.*

$$\frac{40}{1,41852} = 28,1984. \quad \frac{40 - 28,1984}{1,06 - 1} = 196,6932 \quad \frac{196,6932}{1,1236} = 175,0563$$

2. What is the present Worth of a Reversion of a Lease of 60*l.* *per Annum*, to continue 7 Years, but not to commence till the End of 3 Years, allowing 5 *per Cent.* to the Purchaser? *Ans.* 299*l.* 18*s.* 2,4*d.*

3. There is a Lease of a House of 30*l.* *per Annum*, which is yet in being for 4 Years, and the Lessee is desirous to take a Lease in Reversion for 7 Years, to begin when the old Lease shall be expired, what will be the present Worth of the said Lease in Reversion, allowing 5 *per Cent.* to the Purchaser? *Ans.* 142*l.* 16*s.* 3*d.* 2,688 *qrs.*

To find the yearly Income of an Annuity, &c. taken in Reversion.

RULE. Find the Amount of the present Worth, at the given Rate, and for the Time before the Annuity commences;

Change A into P, and find what yearly Rent being sold, will produce P. at the same Rate, and for the Time of its Continuance, which will be the yearly Sum required,

$$pr^t = A.$$

$$\frac{pr^t \times r - pr^t}{r^t - 1} = U.$$

EXAMPLES.

1. What Annuity to be entered upon 2 Years hence, and then to continue 6 Years, may be purchased for 175*l.* 1*s.* 1*d.* 2,048 *qrs.* ready Money at 5 *per Cent.*?

$$\text{then } \frac{\text{Ans. } 175,0563 \times 1,1236 = 196,6933}{1,41852 - 1} = 40\text{.}$$

P

2. The

2. The present Worth for a Lease of an House is 299 *l.* 18 *s.* 2, 4 *d.* taken in Reversion for 7 Years, but not to commence till the End of 3 Years, allowing 5 per Cent. to the Purchaser, what is the yearly Rent? *Ans.* 60 *l.*

3. There is a Lease of an House in being for 4 Years, and the Lessee being minded to take a Lease in Reversion for 7 Years, to begin when the old Lease shall be expired, paid down 142 *l.* 16 *s.* 3 *d.* 2, 688 *qrs.* what was the yearly Rent of the House, when the Lessee was allowed 5 per Cent. for present Payment? *Ans.* 30 *l.*

PURCHASING FREEHOLD or REAL ESTATES.

Is such as is bought to continue for ever.

When *U*, *R* are given to find *W*.

RULE. $\frac{U}{r-1} = W.$

EXAMPLES.

1. What is the Worth of a Freehold Estate of 50 *l.* per Annum, allowing 5 per Cent. to the Buyer?

Answer, $\frac{50}{1,05-1} = 1000 \text{ l.}$

2. What is an Estate of 140 *l.* per Annum, to continue for ever, worth in present Money, allowing 4 per Cent. to the Buyer? *Ans.* 3500 *l.*

3. If a Freehold Estate of 75 *l.* yearly Rent were to be sold, what is it worth, allowing the Buyer 6 per Cent.? *Ans.* 1250 *l.*

II. When *W*, *R* are given to find *U*.

RULE. $w \times r - 1 = U.$

EXAMPLES.

1. If a Freehold Estate is bought for 1000 *l.* and the Allowance of 5 per Cent. is made to the Buyer, what is the yearly Rent? *Ans.* $1,05 - 1 = ,05$. then $1000 \times ,05 = 50 \text{ l.}$

2. If an Estate be sold for 3500 *l.* and 4 per Cent. allowed to the Buyer, what is the yearly Rent? *Ans.* 140 *l.*

3. If a Freehold Estate is bought for 1250 *l.* present Money, and an Allowance of 6 per Cent. made to the Buyer for the same, what is the yearly Rent? *Ans.* 75 *l.*

III. When *W*, *U* are given to find *R*.

RULE. $\frac{w+u}{w} = R.$

EXAM-

EXAMPLES.

1. If an Estate of 50 *l.* per Annum is bought for 1000 *l.* what is the Rate per Cent.?

$$\text{Ans. } \frac{1000 + 50}{1000} = 1,05 = 5 \text{ per Cent.}$$

2. If a Freehold Estate of 140 *l.* per Annum be bought for 3500 *l.* what was the Rate per Cent. allowed? *Ans.* 4 per Cent.

3. If an Estate of 75 *l.* per Annum is sold for 1250 *l.* what is the Rate per Cent. allowed? *Ans.* 6 per Cent.

Purchasing FREEHOLD ESTATES in REVERSION.

To find the Worth of a Freehold Estate in Reversion.

RULE. Find the Worth of the yearly Rent $\frac{u}{r-1} = W.$

Change W into A, and find what Principal being put to Interest will amount to A at the same Rate, and for the Time to come, before the Estate commences, and that will be the Worth of the Estate in Reversion.

$$\frac{a}{r^t} = P.$$

EXAMPLES.

1. If a Freehold Estate of 50 *l.* per Annum, to commence 4 Years hence, is to be sold, what is it worth, allowing the Purchaser 5 per Cent, for present Payment?

$$\text{Ans. } \frac{50}{1,05-1} = 1000, \text{ then } \frac{1000}{1,2155} = 822 \text{ l. } 14 \text{ s. } 1 \text{ d. } 2 \text{ qrs. } +$$

2. What is an Estate of 200 *l.* to continue for ever, but not to commence till the End of 2 Years, worth in ready Money, allowing the Purchaser 4 per Cent.? *Ans.* 4622 *l.* 15 *s.* 7,44 *d.*

3. What is an Estate of 240 *l.* per Annum worth in ready Money, to continue for ever, but not to commence till the End of 3 Years, Allowance being made at 6 per Cent. *Ans.* 3358 *l.* 9 *s.* 10 *d.* 2,24 *qrs.*

To find the yearly Rent of an Estate taken in Reversion.

RULE. Find the Amount of the Worth of the Estate, at the given Rate and Time before it commences. $av^t = A.$

Change A into W, and find what yearly Rent being sold will produce W, at the same Rate, which will be the yearly Rent required.

$$\frac{av^t \times r - av^t}{r} = U.$$

EXAMPLES.

If a Freehold Estate, to commence 4 Years hence, is sold for 822*l.* 14*s.* 1*d.* 2 *qrs.* allowing the Purchaser 5 per Cent. what is the yearly Income? *Ans.* 822,70625 $\times$ 1,2155 = 1000.

$$\text{then, } \frac{1000 \times 1,05 \times 1,05 - 1050}{1,05} = 50*l.*$$

2. A Freehold Estate is bought for 4622*l.* 15*s.* 7,44*d.* which does not commence till the End of 2 Years, the Buyer being allowed 4 per Cent. for his Money, I desire to know the yearly Income? *Ans.* 200*l.*

3. There is a certain Freehold Estate sold for 3358*l.* 9*s.* 10*d.* 2,24 *qrs.* but not to commence till the Expiration of 3 Years, allowing 6 per Cent. for present Payment, what is the yearly Income? *Ans.* 240*l.*

REBATE or DISCOUNT.

A TABLE shewing the present Worth of 1*l.* due at any Number of Years to commence under 31 Rebate, at 5 and 6 per Cent..

Years.	5 Rates.	6	Years.	5 Rates.	6
1	,952381	,943396	16	,458111	,393647
2	,907030	,889996	17	,436296	,371364
3	,863838	,839619	18	,415520	,350343
4	,822702	,792093	19	,395734	,330513
5	,783526	,747258	20	,376889	,311804
6	,746215	,704960	21	,358942	,294155
7	,710682	,665057	22	,341849	,277505
8	,676839	,627412	23	,325571	,261797
9	,644609	,591898	24	,310067	,246978
10	,613913	,558394	25	,295302	,232998
11	,584679	,526787	26	,281240	,219810
12	,556837	,496969	27	,267848	,207368
13	,530321	,468839	28	,255093	,195630
14	,505068	,442301	29	,242946	,184556
15	,481017	,417265	30	,231377	,174110

Note, The above Table is made thus: $1 \div 1,05 = ,952381$ 1st Year's present Worth, and $,952381 \div 1,05 = ,90703$ 2nd Year, and $,90703 \div 1,05 = ,863838$ 3rd Year, &c.

ASSISTANT.

Rebate or Discount. 161

7. When S, T, R are given to find P.

$$\text{RULE. } S = P.$$

EXAMPLES.

1. What is the present Worth of 315*l.* 12*s.* 4*d.* payable 4 Years hence at 6 per Cent.? *Ans.* 1,06*×*1,06*×*1,06*×*1,06 = 1,26247. then

$$\begin{array}{r} 315,6175 \\ \hline 1,26247 \end{array} = 250.$$

by the Table.

$$\begin{array}{r} 315,6175 \\ ,792093 \\ \hline 249,9984124275 \end{array}$$

2. If 344*l.* 14*s.* 9*d.* 1,92 *qrs.* be payable in 7 Years Time, what is the present Worth, Rebate being made at 5 per Cent.? *Ans.* 245 *l.*

3. There is a Debt of 441*l.* 17*s.* 3*d.* 192 *qrs.* which is payable 4 Years hence, but it is agreed to be paid in present Money, what Sum must the Creditor receive, Rebate being made at 6 per Cent.? *Ans.* 350 *l.*

II. When P, T, R are given to find S.

$$\text{RULE. } p \times r^t = S.$$

EXAMPLES.

1. If a Sum of Money due 4 Years hence produce 250*l.* for the present Payment, Rebate being made at 6 per Cent. what was the Sum first due? *Ans.* 250*×*1,26247 = 315 *l.* 12*s.* 4*d.*

2. If 245 *l.* be received for a Debt payable 7 Years hence, and an Allowance of 5 per Cent. to the Debtor for present Payment, what was the Debt? *Ans.* 344*l.* 14*s.* 9*d.* 1,92 *qrs.*

3. There is a Sum of Money due at the Expiration of 4 Years, but the Creditor agrees to take 350 *l.* for present Payment, allowing 6 per Cent. what was the Debt? *Ans.* 441*l.* 17*s.* 3*d.* 1,92 *qrs.*

III. *When S, P, R are given to find T.*

RULE. $\frac{s}{p} = \frac{t}{100}$ *which being continually divided by R, till nothing remains, the Number of those Divisions will be equal to T.*

EXAMPLES.

1. The present Payment of 250 *l.* is made for a Debt of 315 *l.* 12 *s.* 4, 2 *d.* Rebate at 6 *per Cent.* in what Time was the Debt payable?

Ans. $\frac{315,6175}{250} = 1,26247$ *which being continually divided, those Divisions will equal to 4 = the Number of Years.*

2. A Person receives 245 *l.* now for a Debt of 344 *l.* 14 *s.* 9 *d.* 1, 92 *qrs.* Rebate being made at 5 *per Cent.* I demand in what Time the Debt was payable? *Ans.* 7 Years.

3. There is a Debt of 441 *l.* 17 *s.* 3 *d.* 1, 92 *qrs.* due at a certain Time to come, but 6 *per Cent.* being allowed to the Debtor for the present Payment of 350 *l.* I desire to know in what Time the Sum should have been made without any Rebate? *Ans.* 4 Years.

IV. *When S, P, T are given to find R.*

RULE. $\frac{s}{p} = \frac{t}{100}$ *which being extracted by the Rules of Extraction, (the Time given in the Question, shewing the Power,) will be equal to R.*

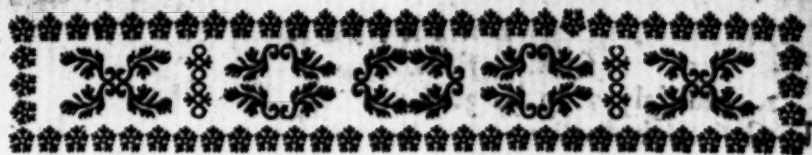
EXAMPLES.

1. A Debt of 315 *l.* 12 *s.* 4, 2 *d.* is due 4 Years hence, but it is agreed to take 250 *l.* now, what is the Rate *per Cent.* that the Rebate is made at?

Ans. $\frac{315,6175}{250} = 1,26247 : \sqrt[4]{1,26247} = 1,06 = 6 \text{ per Cent.}$

2. The present Worth of 344 *l.* 14 *s.* 9 *d.* 1, 92 *qrs.* payable 7 Years hence, is 245 *l.* at what Rate *per Cent.* is Rebate made? *Ans.* 5 *per Cent.*

3. There is a Debt of 441 *l.* 17 *s.* 3 *d.* 1, 92 *qrs.* payable in 4 Years Time, but it is agreed to take 350 *l.* present Payment, I desire to know at what Rate *per Cent.* Rebate is made at? *Ans.* 6 *per Cent.*



THE TUTOR'S ASSISTANT.

PART IV.

DUODECIMALS:

Or, what is generally called *Cross Multiplication*, and
Squaring of Dimensions by Artificers and Workmen.

RULES for multiplying DEODECIMALLY.

1.  UNDER the Multiplicand write the corresponding Denominations of the Multiplier.

2. Multiply each Term in the Multiplicand (beginning at the lowest,) by the Feet in the Multiplier; write each Result under its respective Term, observing to carry an Unit for every 12, from each lower Denomination to its next Superior.

3. In the same Manner multiply the Multiplicand by the Primes in the Multiplier, and, write the Result of each Term one Place more to the right Hand of those in the Multiplicand.

4. Work in the same Manner with the Seconds in the Multiplier, setting the Result of each Term two Places to the right Hand of those in the Multiplicand, and so on for Thirds, Fourths, &c.

Ex.

EXAMPLES.

1. Multiply 7. 9 by 3. 6
by *Gross Multiplication*.

$$\begin{array}{r} 7 \times 9 \\ 3 \times 6 \\ \hline \end{array}$$

$$21. - - = 7 \times 3$$

$$2. 3 - = 9 \times 3$$

$$3. 6 - = 7 \times 6$$

$$- 4. 6 = 9 \times 6$$

$$27. 1. 6$$

By *Practice*.

$$6 \frac{1}{2} \quad 7. \quad 9$$

$$\quad \quad \quad 3. \quad 6$$

$$23. \quad 3$$

$$3. 10 \quad 6$$

$$27. 1. 6$$

By *Duodecimals*.

$$7. \quad 9$$

$$3. \quad 6$$

$$23. \quad 3 \quad \times 3$$

$$3. 10. 6 \times 6$$

$$27. 1. 6$$

Decimals.

$$7.75$$

$$3.5$$

$$3875$$

$$2325$$

$$27.125 = 17. 1. 6.$$

	f.	in.	f.	in.	f.	in.
2. Multiply	8.	5.	by	4.	7.	Facit 38. 6. 11
3. Multiply	9.	8.	by	7.	6.	Facit 72. 6.
4. Multiply	8.	1.	by	3.	5.	Facit 27. 7. 5
5. Multiply	7.	6.	by	5.	9.	Facit 43. 1. 6
6. Multiply	4.	7.	by	3.	10.	Facit 17. 6. 10 ""
7. Multiply	7.	5.	9" by	3.	5.	3". Facit 25. 8. 6. 2 3
8. Multiply	10.	4.	5. by	7.	8.	6. Facit 79. 12. 0. 6. 6
9. Multiply	75.	7.	by	9.	8.	Facit 730. 7. 8.
10. Multiply	97.	8.	by	8.	9.	Facit 854. 7.
11. Multiply	57.	9.	by	9.	5.	Facit 543. 9. 9
12. Multiply	75.	9.	by	17.	7.	Facit 1331. 11. 3
13. Multiply	87.	5.	by	35.	8.	Facit 3117. 10. 4
14. Multiply	179.	3.	by	38.	10.	Facit 6960. 10. 6
15. Multiply	259.	2.	by	48.	11.	Facit 12677. 6. 10
16. Multiply	257.	9.	by	39.	11.	Facit 10288. 6. 3''' ""
17. Multiply	311.	4.	7. by	36.	7.	5. Facit 11402. 2. 4. 11. 11
18. Multipliy	321.	7.	3. by	9.	3.	6. Facit 2988. 2. 10. 4. 6

The APPLICATION.

Artificers Works are computed by different Measures, viz.

1. *Glazing and Masons Flatwork* by the Foot.
2. *Painting, Plastering, Paving, &c.* by the Yard.
3. *Partitioning, Flooring, Roofing, Tiling, &c.* by the Square of 100 Feet.
4. *Brickwork, &c.* by the Rod of 16 Feet $\frac{1}{2}$, whose Square is 272 $\frac{1}{2}$.

MEA-

MEASURING by the FOOT SQUARE, as GLAZIERS, and MASONS Flatwork.

EXAMPLES.

1. There is a House with three Tier of Windows, 3 in a Tier, the Height of the first Tier is 7 Feet 10 Inches, the second 6 Feet 8 Inches, and the third 5 Feet 4 Inches, the Breadth of each is 3 Feet 11 Inches, what will the Glazing come to at 14 d. per Foot?

Duodecimals. $233. \text{ o. } 6 \text{ at } 14 \text{ d. per Foot.}$

7.	10 the	2 d. $\frac{1}{8}$	$233. - . -$	$= 1 \text{ s.}$
6.	8 Heights		$38. 10 . -$	$= 2 \text{ d.}$
5.	4 added.		$- . . \frac{1}{2}$	$= 6 \text{ Parts.}$

19.	10	2)0)27 1. 10 $\frac{1}{2}$
	3 = Windows	L. 13. 11. 10 $\frac{1}{2}$ Answer.
59.	6 in a Tier.	

3. 11. Breadth,

178. 6

54. 6. 6

233. o. 6

2. What is the Worth of 8 Panes of Glass, each measuring 4 Feet 10 Inches long, and 2 Feet 11 Inches broad, at 4 d. $\frac{1}{8}$ per Foot? *Ans.* 1 l. 18 s. 9 d.

3. There are 8 Windows to be glazed, each measures 1 Foot 6 Inches wide, and 3 Feet in Height, how much will they come to at 7 d. $\frac{3}{4}$ per Foot? *Ans.* 1 l. 3 s. 3 d.

4. What is the Price of a Marble Slab, whose Length is 5 Feet 7 Inches, and Breadth 1 Foot 10 Inches, at 6 s. per Foot? *Ans.* 3 l. 1 s. 5 d.

MEASURING by the YARD SQUARE, as PAVIORS, PAINTERS, PLAISTERERS, and JOINERS.

Note, Divide the Square Feet by 9, and it will give the Number of Square Yards.

EXAMPLES.

5. A Room is to be ceiled, whose Length is 74 Feet 9 Inches, and Width 11 Feet 6 Inches, what will it come to at 3 s. 10 d. $\frac{1}{2}$ per Yard? *Ans.* 18 l. 10 s. 1 d.

6. What will the Paving of a Court-yard come to, at 4 d. $\frac{1}{2}$ per Yard, the Length being 58 Feet 6 Inches, and Breadth 54 Feet 9 Inches? *Ans.* 7 l. 0 s. 10 d.

7. A

7. A Room painted 97 Feet 9 Inches about, and 9 Feet 10 Inches high, what does it come to at 2 s. 8 d. $\frac{1}{4}$ per Yard? *Ans.* 14 l. 11 s. 1 d.

8. What is the Content of a Piece of Wainscoting in Yards Square, that is 8 Feet 3 Inches long, and 6 Feet 6 Inches broad, and what will it come to at 6 s. 7 d. $\frac{1}{2}$ per Yard? *Ans.* 1 l. 19 s. 5 d. $\frac{1}{4}$.

9. What will the Paving a Court-yard come to at 3 s. 2 d. per Yard, if the Length be 27 Feet 10 Inches, and the Breadth 14 Feet 9 Inches? *Ans.* 7 l. 4 s. 5 d.

10. A Person has paved a Court-yard 42 Feet 9 Inches in Front, and 68 Feet 6 Inches in Depth, and in this he laid a Foot-way the Depth of the Court, of 5 Feet 6 Inches in Breadth: The Foot-way is laid with Purbeck Stone, at 3 s. 6 d. per Yard, and the rest with Pebbles, at 3 s. per Yard, what will the Whole come to? *Ans.* 49 l. 17 s. 0 d. $\frac{1}{2}$.

11. What will the Plaistering a Ceiling, at 10 d. per Yard, come to, supposing the Length 21 Feet 8 Inches, and the Breadth 14 Feet 10 Inches? *Ans.* 1 l. 9 s. 8 d. $\frac{1}{4}$.

12. What will the Wainscoting a Room come to, at 6 s. per Square Yard, supposing the Height of the Room, (taking in the Cornice and Moulding) is 12 Feet 6 Inches, and the Compass 83 Feet 8 Inches, the 3 Window Shutters each 7 Feet 8 Inches by 3 Feet 6 Inches, and the Door 7 Feet by 3 Feet 6 Inches, the Shutters and Door, being work'd on both Sides, is reckoned Work and half Work? *Ans.* 36 l. 12 s. 2 d. $\frac{1}{2}$.

MEASURING by the SQUARE of 100 Feet, as FLOORING, PARTITIONING, ROOFING, TILING, &c.

EXAMPLES.

13. In 173 Feet 10 Inches in Length, and 10 Feet 7 Inches in Height of Partitioning, how many Squares? *Ans.* 18 Squares, 39 Feet, 18 Inches, 10 P.

14. If a House of three Stories, besides the Ground Floor, was to be floored at 6 l. 10 s. per Square, and the House measures 20 Feet 8 Inches, by 16 Feet 9 Inches; there are 7 Fire Places, whose Measure are two of 6 Feet, by 4 Feet 6 Inches each, two of 6 Feet by 5 Feet 4 Inches each, and two of 5 Feet 8 Inches, by 4 Feet 8 Inches, and the seventh of 5 Feet 2 Inches, by 4 Feet, and the Well-hole for the Stairs is 10 Feet 6 Inches, by 8 Feet 9 Inches, what will the Whole come to? *Ans.* 53 l. 13 s. 3 d. $\frac{1}{4}$.

15. If

15. If a House measures within the Walls 52 Feet 8 Inches in Length, and 30 Feet 6 Inches in Breadth, and the Roof be of a true Pitch, what will it come to roofing, at 10 s. 6 d. per Square? *Ans.* 12 l. 12 s. 11 d. $\frac{3}{4}$.

Note, In Tiling, Roofing, and Slating, it is customary to reckon the Flat, and Half of any Building within the Wall, to be the Measure of the Roof of that Building, when the said Roof is of a true Pitch, i. e. when the Rafter is $\frac{1}{2}$ of the Breadth of the Building; but if the Roof is more or less than the true Pitch, they measure from one Side to the other, with a Rod or String.

16. What will the Tiling of a Barn cost, at 25 s. 6 d. per Square, the Length being 43 Feet 10 Inches, and Breadth 27 Feet 5 Inches on the Flat, the Eave Boards projecting 16 Inches on each Side? *Ans.* 24 l. 9 s. 5 d. $\frac{1}{2}$.

MEASURING by the ROD.

Note, Bricklayers always value their Work at the Rate of a Brick and a Half thick, and if the Thickness of the Wall is more or less, it must be reduced to that Thickness by this.

RULE. Multiply the Area of the Wall by the Number of Half Bricks the Thickness of the Wall is of; the Product, divided by 3, gives the Area.

EXAMPLES.

17. If the Area of a Wall be 4085 Feet, and the Thickness two Bricks and a Half thick, how many Rods doth it contain? *Ans.* 25.

18. If a Garden Wall be 254 Feet round, and 12 Feet 7 Inches high, and three Bricks thick, how many Rods doth it contain? *Ans.* 23 Rods, 178 Feet.

19. How many Square Rods are there in a Wall 62 $\frac{1}{2}$ Feet long, 14 Feet 8 Inches high, and 2 $\frac{1}{2}$ Bricks thick? *Ans.* 5 Rods, 167 Feet.

20. If the Side Walls of an House be 28 Feet 10 Inches in Length, and the Height of the Roof from the Ground 53 Feet 8 Inches, and the Gable (or triangular Part at Top) to rise 42 Course of Bricks (reckoning 4 Course to a Foot.) Now, 20 Feet high is 2 $\frac{1}{2}$ Bricks thick, 20 Feet more, at 2 Bricks thick, 15 Feet 8 Inches more, at 1 $\frac{1}{2}$ Bricks thick, and the Gable at 1 Brick thick, what will the whole Work come to, at 5 l. 16 s. per Rod? *Ans.* 48 l. 13 s. 5 d. $\frac{1}{2}$.

Mul.

Multiplying several Figures by several, and the Product to be produced in one Line only.

RULE. Multiply the Units of the Multiplicand by the Units of the Multiplier, setting down the Units of the Product, and carry the Tens; next multiply the Tens in the Multiplicand by the Units of the Multiplier, to which add the Product of the Units of the Multiplicand multiplied by the Tens in the Multiplier, and the Tens carried; then multiply the Hundreds in the Multiplicand by the Units of the Multiplier, adding the Product of the Tens in the Multiplicand multiplied by the Tens in the Multiplier, and the Units of the Multiplicand by the Hundreds in the Multiplier; and so proceed till you have multiplied the Multiplicand all through, by every Figure in the Multiplier.

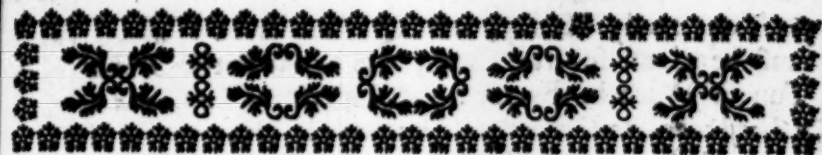
EXAMPLES.

$$\begin{array}{r}
 \text{Multiply} \quad - - - 35234 \\
 \text{by} \quad - - - 52424 \\
 \hline
 1847107216
 \end{array}$$

$$\begin{array}{r}
 35234 \\
 52424 \\
 \hline
 140936 \\
 70468 \\
 \hline
 140936 \\
 70468 \\
 \hline
 176170 \\
 \hline
 1847107216
 \end{array}$$

EXPLANATION.

First, $4 \times 4 = 16$, that is, 6 and carry 1. *Secondly*, $3 \times 4 + 4 \times 2$, and 1 that was carried is 21, set down 1 and carry 2. *Thirdly*, $2 \times 4 + 3 \times 2 + 4 \times 4 + 2$ carried = 32, that is 2, and carry 3. *Fourthly*, $5 \times 4 + 2 \times 2 + 3 \times 4 + 4 \times 2 + 3$ carried = 47, set down 7 and carry 4. *Fifthly*, $3 \times 4 + 5 \times 2 + 2 \times 4 + 3 \times 2 + 4 \times 5 + 4$ carried = 60, set down 0 and carry 6. *Sixthly*, $3 \times 2 + 5 \times 4 + 2 \times 2 + 3 \times 5 + 6$ carried = 51, set down 1 and carry 5. *Seventhly*, $3 \times 4 + 5 \times 2 + 2 \times 5 + 5$ carried = 37 that is 7 and carry 3. *Eighthly*, $3 \times 2 + 5 \times 5 + 3$ carried = 34, set down 4, and carry 3. *Lastly*, $3 \times 5 + 3$ carried = 18, which being multiplied by the last Figure in the Multiplier, set the whole down, and the work is finished.



THE TUTOR'S ASSISTANT.

PART V.

*A Collection of QUESTIONS set down promiscuously, for
the greater Trial of the foregoing RULES.*



W

RITE down two Millions, five Hundred
and two Thousand, two Hundred and five.

2. What is the Value of 14 Barrels of
Soap, at 4 d. $\frac{1}{2}$ per lb. each Barrel contain-
ing 254 lb.? *Answer*, 66 l. 13 s. 6 d.

3. If 100 l. Principal gain 5 l. Interest
in 12 Months, what Principal will gain 20 l. in 8 Months?
Answer, 600 l.

4. What Number is that from which, if the Square of
14 is deducted, and to the Remainder the Square of 12 be
added, the Sum will be 250? *Ans.* 302.

5. A and B trade together; A put in 320 l. for 5 Months,
B 460 l. for three Months, and they gained 100 l. what
must each Man receive? *Answer*, A 53 l. 13 s. 9 d. $\frac{27}{8}$,
and B 46 l. 6 s. 2 d. $\frac{28}{8}$.

6. How many Yards of Cloth, at 17 s. 6 d. per Yard,
can I have for 13 cwt. 2 qrs, of Wool, at 14 d. per lb.? $\frac{2}{3}$
Ans. 169 Yards, 3 qrs. $\frac{1}{3}$.

7. What Number added to the Cube of 21, will make
the Sum equal to 113 Times 147? *Ans.* 7350.

8. If I buy 1000 Ells of *Flemish* Linnen for 90 l. what
may I sell it at per Ell in *London*, to gain 10 l. by the Whole?
Ans. 3 s. 4 d. per Ell.

9. A has 648 Yards of Cloth, at 14 s. per Yard, ready
Money, but in Barter will have 16 s. B has Wine at 42 l.

Q

per

per Tun, ready Money, the Question is how much Wine must be given for the Cloth, and what is the Price of a Tun of Wine in Barter? *Ans.* 48 *l.* the Tun, and 10 Tun 3 Hogsheads, 12 Gallons of Wine must be given for the Cloth.

10. A Jeweller sold Jewels to the Value of 1200 *l.* for which he received in Part 876 French Pistoles, at 16 *s.* 6 *d.* each, what Sum remains unpaid; *Ans.* 477 *l.* 6 *s.*

11. An Oilman bought 417 *cwt.* 1 *qr.* 15 *lb.* Gross Weight, of Train Oil, Tare 20 *lb.* per 112 *lb.* how many neat Gallons were there, allowing 7 $\frac{1}{2}$ *lb.* to a Gallon? *Ans.* 5120 Gallons.

12. Bought threescore Pieces of Holland for three Times as many Pounds, and sold them again for four Times as much; but if they had cost me as much as I sold them for, what should I have sold them for to gain after the same Rate? *Ans.* 320 *l.*

13. What Number taken from the Square of 54 will leave 19 Times 46? *Ans.* 2042.

14. If I buy a Yard of Cloth for 14 *s.* 6 *d.* and sell it for 16 *s.* 9 *d.* what do I gain per Cent.? *Ans.* 15 *l.* 10 *s.* 4 *d.* $\frac{2}{3}$

15. Bought 27 Bags of Ginger, each weighing, Gross 84 *lb.* $\frac{3}{4}$, Tare 1 *lb.* $\frac{3}{8}$ per Bag, Trett, 4 *lb.* per 104 *lb.* what do they come to at 8 *d.* $\frac{1}{2}$ per *lb.*? *Ans.* 76 *l.* 13 *s.* 3 *d.* $\frac{1}{2}$.

16. If $\frac{2}{3}$ of an Ounce cost $\frac{1}{8}$ of a Shilling, what will $\frac{3}{8}$ *lb.* cost? *Ans.* 17 *s.* 6 *d.*

17. If $\frac{5}{8}$ of a Gallon cost $\frac{5}{8}$ of a *l.* what will $\frac{5}{8}$ of a Tun cost? *Ans.* 105 *l.*

18. A young Man received 210 *l.* which was $\frac{2}{3}$ of his elder Brother's Portion; now three Times the elder Brother's Portion was half of the Father's Estate, I demand how much the Estate was? *Ans.* 1890 *l.*

19. If the Salary of an Officer be 48,5 *l.* per Annum, what must he receive for 232 Days? *Ans.* 30 *l.* 16 *s.* 6 *d.* 2 *qrs.*

20. A Gentleman spends, one Day with another, 1 *l.* 7 *s.* 10 *d.* $\frac{1}{2}$, and at the Year's End layeth up 340 *l.* what is his yearly Income? *Ans.* 848 *l.* 14 *s.* 4 *d.* $\frac{1}{2}$.

21. A Lady's Fortune consisted of a Cabinet, worth 200 *l.* containing 16 Drawers, each having two Partitions, each of which contained 37 *l.* and two Crowns, pray what was her Portion? *Ans.* 1400 *l.*

22. A has 13 Fother of Lead to send abroad, each being 19 $\frac{1}{2}$ Times 112 *lb.* B has 39 Casks of Tin, each 388 *lb.* how many Ounces Difference is there in the Weight of these Commodities? *Ans.* 212160.

23. A Captain and 160 Sailors took a Prize worth 1360*l.* of which the Captain had $\frac{1}{3}$ for his Share, and the rest was equally divided among the Sailors, what was each Man's Part? *Ans. The Captain had 272 l. and each Sailor 6 l. 16 s.*

24. What Number is that, to which if you add $7\frac{2}{3}$, the Whole will be $12\frac{1}{4}$? *Answer, 4 $\frac{1}{2}$.*

25. A certain Usurer put out 75*l.* for 12 Months, and received for Principal and Interest 81*l.* I demand at what Rate *per Cent.* he received Interest? *Ans. 8 l. per Cent.*

26. What will 956*l.* amount to in $7\frac{1}{2}$ Years, at 5 *per Cent.* Simple Interest? *Ans. 1314 l. 10 s.*

27. At what Rate *per Cent.* will 956*l.* amount to 1314*l.* 10*s.* in $7\frac{1}{2}$ Years, at Simple Interest? *Ans. 5 per Cent.*

28. If for 1*l.* 4*s.* I have 1200*lb.* Weight carried 36 Miles, how many *lb.* Weight can I have carried 24 Miles for the same Money? *Ans. 1800 lb.*

29. If 8 Cannons in one Day spend 48 Barrels of Powder, I demand how many Barrels 24 Cannons will spend in 22 Days? *Answer, 3168.*

30. What Number is that, which being multiplied by $\frac{2}{3}$, will produce $\frac{1}{4}$? *Answer, $\frac{3}{8}$.*

31. *T* has 24 Cows worth 72*s.* each, and *B* 7 Horses worth 13*l.* apiece, how much will make good the Difference, in case they interchange their said Drove of Cattle? *Ans. 4 l. 12 s.*

32. A Man dies and leaves 120*l.* to be given to 3 Persons, *viz.* *A*, *B* and *C*; to *A* a Share unknown; *B* twice as much as *A*, and *C* as much as *A* and *B*, what is the Share of each? *Answer. A 20 l. B 40 l. and C 60 l.*

33. A Person dying left his Widow 1780*l.* and 1250*l.* to each of his 4 Children; he had been $25\frac{1}{2}$ Years in Trade, and had cleared (at an Average) 126*l.* a Year, what had he to begin with? *Ans. 3567 l.*

34. There is a Sum of 1000*l.* to be divided among 3 Men, in such Manner, that if *A* has 3*l.* *B* shall have 5*l.* and *C* 8*l.* how much must each Man have? *Ans. A 187 l. 10 s. B 312 l. 10 s. and C 500 l.*

35. A Piece of Wainscot is 8 Foot 6 Inches and $\frac{1}{2}$ long, and 2 Foot 9 Inches $\frac{3}{4}$ broad, what is the Superficial Content? *Ans. 24 Feet 0'. 3". 4. 6.*

36. How many Changes may be rung on 6 Bells? *Ans. 720.*

37. A Merchant at *Amsterdam* is indebted to another in *London*, in 642*l.* and would pay it in *Spanish* Guilders, at

2s. per Piece, how many must the *English Merchant* receive? *Ans.* 6420.

38. If 360 Men be in Garrison, and have Provision for 6 Months; but hearing of no Relief at the End of 5 Months, how many Men must depart, that the Provisions may last so much longer? *Ans.* 288.

39. The less of two Numbers is 187, their Difference 34, the Square of the Product is required? *Ans.* 1707920929.

40. A Butcher sends his Man with 216 l. to a Fair to buy Cattle; Oxen at 11 l. Cows at 40 s. Colts at 1 l. 5 s. and Hogs at 1 l. 15 s. per Piece, and of each a like Number, how many of each Sort did he buy? *Answer.* 13 of each Sort, and 8 l. over.

41. What Number added to $11 \frac{5}{7}$ will produce $36 \frac{332}{818}$. *Ans.* $24 \frac{518}{818}$.

42. What Number multiplied by $\frac{3}{7}$ will produce $11 \frac{9}{17}$. *Answer.* $26 \frac{46}{17}$.

43. A Man had 12 Sons, the youngest was 3 Years old, and the elder 58; they increased in Arithmetical Progression, what was the common Difference of their Ages? *Ans.* 5 Years.

44. What is the Value of 179 Hogsheads of Tobacco, each weighing 13 cwt. at 2 l. 7 s. 1 d. per cwt.? *Answer,* 5478 l. 2 s. 11 d.

45. My Factor sends me Word he has bought Goods to the Value of 500 l. 13 s. 6 d. upon my Account, what will his Commission come to at $3 \frac{1}{2}$ per Cent.? *Ans.* 17 l. 10 s. 5 d. 2 qrs, $\frac{68}{1000}$.

46. Miss Kitty told her Sister Charlotte, whose Father had before left them 12 Thousand 12 Hundred Pounds apiece; that their Grandmother by Will had raised her Fortune to 15000 l. and had made her own 20,000 l. what did the old Lady leave between them? *Ans.* 8600 l.

47. A Snail in getting up a May-pole, only 20 Feet high, was observed to climb 8 Feet every Day, but every Night he came down again 4 Feet; in what Time, by this Method, did he reach the Top of the Pole? *Ans.* 4 Days.

48. If the $\frac{2}{3}$ of 6 be 3, what will the $\frac{1}{4}$ of 20 be? *Ans.* $7 \frac{1}{2}$.

49. What is the Difference between 14676, and the Fourth of itself? *Ans.* 11007.

50. There is in 3 Bags the Sum of 1468 l. viz. in the first Bag 461 l. in the second 581 l. what was in the third Bag? *Ans.* 426 l.

51. What

51. What is the Decimal of 3 qrs. 14 lb. of an *cwt.*?
Ans. .875.

52. How many lb. of Sugar, at 4 d. $\frac{1}{2}$ per lb. must be given in Barter for 60 Gross of Incle, at 8 s. 8 d. per Gross. *Ans.* 1356 $\frac{2}{3}$.

53. If I buy Yarn for 9 d. the lb. and sell it again for 13 d. $\frac{1}{2}$ per lb. what is the Gain per Cent.? *Ans.* 50 l.

54. A Tobacconist would mix 20 lb. of Tobacco, at 9 d. per lb. with 60 lb. at 12 d. per lb. 40 lb. at 18 d. the lb. and with 12 lb. at 2 s. per lb. what is a lb. of this Mixture worth? *Ans.* 1 s. 2 d. $\frac{1}{4}$, $\frac{9}{11}$.

55. What is the Value of 14 Barrels of Soap, at 4 d. $\frac{1}{2}$ per lb. each Barrel, containing 254 lb.? *Ans.* 66 l. 13 s. 6 d.

56. Two Persons, *A* and *B*, owe several Debts; the lesser Debt being that of *A*, is 2173 l. the Difference is 371 l. what is the Debt of *B*? *Ans.* 2544 l.

57. What is the Difference between twice eight and twenty, and twice twenty eight: As also, between twice five and fifty, and twice fifty five? *Ans.* 20. and 50.

58. What Number taken from the Square of 54 will leave 19 Times 46? *Ans.* 2042.

59. A School-master being ask'd how many Scholars he had, said, if I had as many more, half as many, and 1 Quarter as many, I should have 99, how many had he? *Ans.* 36.

60. An ancient Lady being asked how old she was, to avoid a direct Answer, said, I have 9 Children and there are 3 Years between the Birth of each of them, the Eldest was born when I was 19 Years old, which is now exactly the Age of the youngest, how old was the Lady? *Ans.* 62 Years old.

61. What Number is that which being added to 168 makes the Sum to be 706? *Ans.* 538.

62. From 100 l. borrowed take 72 paid,

'Twas a Virgin that lent it, what's due to the Maid?
Ans. 28 l.

63. If when Wheat is 4 s. per Bushel, the 20 Penny Loaf weighs 18 lb. what must the said 20 Penny Loaf weigh, when Wheat is 6 s. the Bushel? *Ans.* 12 lb.

64. Whereas a Noble and a Mark just 15 Yards did buy, How many Ells of the same Cloth for 50 l. had I?
Ans. 600.

65. A Broker bought for his Principal in the Year 1720, 400 l. Capital Stock in the South Sea at 650 l. per Cent.

Cent. and sold it again when it was worth but 130 *per Cent.* how much was lost in the whole? *Ans.* 2080*l.*

66. What Number added to the 43d Part of 4429 will make the Sum 240? *Ans.* 137.

67. What Number deducted from the 26th Part of 2262 will leave the 87th Part of the same? *Ans.* 61.

68. A Gentleman went to Sea at 17 Years of Age, 8 Years after that he had a Son born who lived 46 Years, and died before his Father, after whom the Father lived twice 20 Years, and then died also, what was the Age of the Father when he died? *Ans.* 111 Years.

69. C hath Candles at 6 *s.* *per Dozen* ready Money, but in Barter will have 6 *s.* 6 *d.* *per Dozen*, D hath Cotton at 9 *d.* *per lb.* ready Money, I demand what Price the Cotton must be at in Barter, also how much Cotton must be barter'd for 100 Dozen of Candles? *Ans.* the Cotton 9 *d.* 3 *qrs.* *per lb.* and 7 *cwt.* 0 *qrs.* 16 *lb.* of Cotton must be given for 100 Dozen of Candles.

70. The Sum of two Numbers is 360, the less 114, what is their Difference, Product and larger Quote? *Ans.* 132 *Diff.* 28044 *Product*, 2 $\frac{3}{15}$ *Quote*.

71. A Brigade of Horse consisting of 384 Men is to be formed into a Square Body, having 32 Men in Front, how many Ranks will there be? *Ans.* 12.

72. If a Clerk's Salary be 73 *l.* a Year what is that *per Day*? *Answer*, 4 *s.*

73. A hath an Estate of 53 *per Annum*, and payeth 5 *s.* 10 *d.* to the Subsidy, what must B pay, whose Estate is worth 100 *l.* *per Annum*? *Answer*, 11 *s.* 0 *d.* $\frac{4}{33}$.

74. If I buy 100 Yards of Ribband at 3 Yards for a Shilling, and 100 more at 2 Yards for a Shilling, and sell it at the Rate of 5 Yards for 2 Shillings, whether do I get or lose, and how much? *Ans.* lose 3 *s.* 4 *d.*

75. What is the Value of $\frac{5}{8}$ of 20 *s.*? *Ans.* 12 *s.* 6 *d.*

76. What Number is that which if you take $\frac{3}{5}$, the Remainder will be $\frac{1}{8}$? *Answer*, $\frac{29}{40}$.

77. My Purse and Money, quoth Dick, are worth 12 *s.* 8 *d.* but the Money is worth 7 of the Purse, pray what was the there in it? *Ans.* 11 *s.* 1 *d.*

78. What Number is that which maketh 9 to be the $\frac{2}{3}$ of it? *Ans.* 13 $\frac{1}{2}$.

79. A Maltster has several Sorts of Malt, one at 4 *s.* 6 *d.* another at 4 *s.* and a third at 3 *s.* 6 *d.* a Bushel; to mix an equal Quantity of each, what must be the Price of a Bushell? *Answer*, 4 *s.*

80. A

80. A Farmer is willing to make a Mixture of Rye at 4s. a Bushel, Barley at 3s. and Oats at 2s. how much must he take of each to sell it at 2s. 6d. the Bushel? *Answer, 6 of Rye, 6 of Barley, and 24 of Oats.*

81. If $\frac{3}{8}$ of a Ship be worth 3740*l.* what is the Worth of the Whole? *Ans. 9973*l.* 6*s.* 8*d.**

82. A Person said he had 20 Children, and that it happened there was a Year and a Half between each of their Ages, his eldest was born when he was 24 Years old, and the Age of his youngest is now one and twenty, what was the Father's Age? *Ans. 73 $\frac{1}{2}$ Years.*

83. Bought a Cask of Wine for 62*l.* 8*s.* how many Gallons were in the same, when a Gallon was valued at 5*s.* 4*d.* *Ans. 234.*

84. A owes B 296*l.* 17*s.* but he compounds for 7*s.* 6*d.* in the Pound, what must B receive for his Debt? *Ans. 111*l.* 6*s.* 4*d.* $\frac{1}{2}$.*

85. How many Dozens of Stockings at 11 Groats per Pair, may I buy for 190*l.* 12*s.* *Ans. 86 Doz. 7 Pair $\frac{2}{3}$.*

86. A Sheepfold was robbed three Night successively; the first Night half the Sheep were stolen, and half a Sheep more; the second Night half of the Remainder were lost, and half a Sheep more; the last Night they took half what were left, and half a Sheep more; by which Time they were reduced to 20; how many were they at first? *Ans. 167.*

87. The Spectator's Club of fat People, tho' it consisted but of 15 Persons, is said to weigh no less than 3 Tons, how much, at an Equality was that per Man? *Ans. 4 cwt.*

88. A merry young Fellow in a small Time got the better of $\frac{1}{3}$ of his Fortune; by Advice of his Friends, he then gave 2200*l.* for an Exempt's Place in the Guards; his Profusion continued till he had no more than 880 Guineas left, which he found by Computation was just $\frac{3}{20}$ Part of his Money after the Commission was bought, pray what was his Fortune at first? *Answer, 10450*l.**

89. A owes B 395*l.* 18*s.* but compounds the whole Debt for 100*l.* 12*s.* what is that in the Pound? *Answer, 5*s.* 0*d.* $\frac{3}{4}$ $\frac{7746}{7918}$.*

90. How many Dollars, at 4*s.* 4*d.* each must be given for 360 Guilders, at 2*s.* 2*d.* each? *Ans. 180.*

91. Four Men have a Sum of Money to be divided amongst them in such a Manner, that the first shall have $\frac{1}{3}$ of

of it, the second $\frac{1}{4}$, the third $\frac{1}{6}$, and the fourth the Remainder, which is 28, what was the Sum? *Ans.* 112*l.*

92. What is the Amount of 1000*l.* for 5 Years $\frac{1}{2}$, at 4 $\frac{1}{2}$ per Cent. Simple Interest? *Ans.* 1261*l.* 5*s.*

93. Sold Goods amounting to the Value of 700*l.* for 2 4 Months, what is the present Worth, at 5 per Cent. Simple Interest? *Ans.* 682*l.* 19*s.* 5*d.* 2*qrs.*

94. A Room is 30 Foot long, and 18 Feet wide, is to be covered with painted Cloth, how many Yards of $\frac{3}{4}$ wide will cover it? *Answer,* 80 Yards.

95. There are two Numbers, the one 48, the other twice as much, what is the Difference between their Sum and Difference? *Answer,* 96.

96. Hetty told her Brother George, that tho' her Fortune on her Marriage took 19312*l.* out of the Family, it was but $\frac{3}{5}$ of two Years Rent, Heaven be praised! of his yearly Income, pray what was that? *Answer,* 16093*l.* 6*s.* 8*d.* a Year.

97. There are two Numbers, the one 25, the other the Square of 25, I demand the Square Root of the Sum of their Squares? *Answer,* 625,4998.

98. Says *A* to *B*, if I had 4 of your Sheep, I should have as many as you, and says *B* to *A*, if I had 4 of yours, I should have twice as many as you; how many had each? *Answer,* *A* 20, *B* 28.

99. *A*, *B* and *C* trading together gained 120*l.* which is to be shared according to each Man's Stock; *A* put in 140*l.* *B* 300*l.* and *C* 160*l.* what is each Man's Share? *Ans.* *A* 28, *B* 60, *C* 32.

100. A Gentleman having 50*s.* to pay among his Labourers for a Day's Work, would give to every Boy 6*d.* to every Woman 8*d.* and to every Man 16*d.* the Number of Boys, Women and Men, was the same, I demand the Number of each? *Answer,* 20 of each Sort.

101. There are three Numbers, 17, 19, and 48, I demand the Difference between the Sum of the Squares of the first and last, and the Cube of the middlemost? *Ans.* 4266.

102. A Stone that measures 4 Feet 6 Inches long, 2 Feet 9 Inches broad, and 3 Feet 4 Inches deep, how many solid Feet doth it contain? *Answer,* 41 Feet 3 Inches.

103. What does the whole Pay of a Man of War's Crew of 640 Sailors amount to for 32 Month's Service, each Man's Pay being 22*s.* 6*d.* per Month? *Ans.* 23040*l.*

104. If

104. If I have an Estate of 470*l.* per Annum, what may I expend daily, and yet lay up 130*l.* per Annum? *Answer*, 18*s.* 7*d.* $\frac{1}{2}$ $\frac{20}{63}$.

105. What Number is that, which being divided by 19, the Quotient will be 72? *Ans.* 1368.

106. Reduce 13 $\frac{1}{2}$ Bushels of Coals to the Fraction of a Chaldron. *Facit* $\frac{3}{8}$.

107. Bought 28 *qrs.* 2 Bushels of Wheat at 4*s.* 6*d.* per Bushel, what does it come to? *Answer*, 50*l.* 17*s.*

108. How many Pounds of Coffee at 5*s.* 9*d.* per lb. is equal in Value to 426 lb. of Tea at 13*s.* 4*d.* per lb.? *Ans.* 987 $\frac{57}{65}$.

109. What is the Value of 27 Dozen 10 lb. of Candles at 5*d.* per lb.? *Answer*, 6*l.* 19*s.* 2*d.*

110. A Traveller would change 500 French Crowns at 4*s.* 6*d.* per Crown into Sterling Money, but he must pay a half-penny per Crown for Change, how much must he receive? *Answer*, 111*l.* 9*s.* 2*d.*

111. There are two Numbers, the one 63, and other, $\frac{1}{2}$ as much, I demand the Product of their Squares, and the Difference of their Product and Sum? *Answer*, Product of their Squares 39382420,5, Difference 1890.

112. A and B traded together and gained 100*l.* A put in 640*l.* B put in so much, that he must receive 60*l.* of the Gain. I demand how much B put in? *Answer*, 960.

113. Of what Principal Sum did 20*l.* Interest arise in 1 Year, at the Rate of 5 per Cent. per Annum? *Ans.* 400*l.*

114. Having bought 40 Yards of Cloth, at 8*s.* per Yard, and 70 Yards at 12*s.* what is the Value of both Pieces? *Ans.* 58*l.*

115. Two Men depart both from one Place, the one goes North, and the other South; the one goes 7 Miles a Day, and the other 11 Miles a Day; how far are they distant the 12th Day of their Departure? *Ans.* 216 Miles.

116. In 672 Spanish Guilders, how many French Pistoles at 17*s.* 6*d.* pe. Piece? *Ans.* 76 $\frac{28}{33}$.

11. In 7 Cheeses, each weighing 1 *cwt.* 2 *qrs.* 5 *lb.* how many Allowances for Seamen may be cut, each weighing 5 *oz.* 7 *dr.*? *Ans.* 3563 $\frac{35}{7}$.

118. If 48 taken from 120 leave 72, and 72 taken from 91 leave 19, and 7 taken from thence leave 12, what Number is that, out of which, when you have taken 48, 72, 19 and 7, leaves 12? *Ans.* 158.

119. A

119. A Farmer ignorant in Numbers, ordered 500 l. to be divided among his five Sons, thus: Give *A*, says he, $\frac{1}{3}$, *B* $\frac{1}{4}$, *C* $\frac{1}{5}$, *D*, $\frac{1}{6}$, and *E* $\frac{1}{7}$ Part, divide this equitably among them, according to the Father's Intention. *Ans.* *A* 152 $\frac{1392}{2754}$, *B* 114 $\frac{1044}{2754}$, *C* 91 $\frac{1386}{2754}$, *D* 76 $\frac{696}{2754}$, and *E* 65 $\frac{296}{2754}$.

120. When first the Marriage Knot was ty'd,

Between my Wife and me;

Her Age did mine as far exceed,

As three Times three does three.

But when seven Years and half seven Years,

We Man and Wife had been,

My Age came then as near to her's,

As Eight is to Sixteen.

Quæst. What was each of our Ages when we married?

Ans. 10 $\frac{1}{2}$ Years the Man, 31 $\frac{1}{2}$ the Woman.

121. If 12 Oxen will eat 3 $\frac{1}{2}$ Acres of Grass in 4 Weeks, and 21 Oxen will eat 10 Acres in 9 Weeks, how many Oxen will eat 24 Acres in 18 Weeks, the Grass being allowed to grow uniformly? *Ans.* 36 Oxen.

122. A Lady was ask'd the Age, who reply'd thus,

My Age is multiplied by three,

Two Seventh of that Product tripl'd be,

The Square Root of two Ninths of that is four;

Now tell my Age or never see me more.

Ans. 28 Years.

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